



PANJAB UNIVERSITY, CHANDIGARH-160014 (INDIA)

OUTLINES OF TESTS SYLLABI AND COURSES OF READING

FOR

Bachelor of Vocation (Medical Lab Technology)

Session 2018-19

(1st to 6th Semester)

SCHEME of B.Voc. (MLT)

(SEMESTER SYSTEM)

***Refer to Generic Components Common to all B.Voc. Courses**

Semester I								
Paper Code	Title	Generic/Skill Component	Theory/ Practical	Internal (Theory)	External (Theory)	Internal (Practical)	External (Practical)	Credit
*GEN - 101	Communication Skills	Generic	Theory	20	80	--	--	6
*GEN - 102	Fundamentals of Information Technology	Generic	Theory	20	80	--	--	6
MLT103	Basics of Human Anatomy	Skill	Theory & Practical	10	40	10	40	6
MLT104	Introduction to Laboratory Equipments	Skill	Theory & Practical	10	40	10	40	6
MLT105	Introduction to Hematology	Skill	Theory & Practical	10	40	10	40	6
SEMESTER II								
*GEN 201	Soft Skills and Personality Development	Generic	Theory	20	80	--	--	6
GEN 202	Introduction to Medical Technology Healthcare Systems	Generic	Theory	20	80	--	--	6
MLT203	Basics Of Physiology	Skill	Theory & Practical	10	40	10	40	6
MLT 204	Basics of Biochemistry	Skill	Theory & Practical	10	40	10	40	6
MLT 205	Analytical Laboratory Testing Process -I	Skill	Theory & Practical	10	40	10	40	6
**SIT-201	Summer Industrial Training	Skill	Practical	--	--	20	80	6

**** Summer Industrial Training of 4-6 weeks in a relevant Industry after 2nd Semester Examinations during summer break. Training report by the student to be submitted within in one week of start of 3rd Semester. Viva-Voce examination to be held within 3-weeks of the start of 3rd semester.**

Job Role:Medical Lab Technician

Semester III								
Paper Code	Title	Generic/Skill Component	Theory/Practical	Internal (Theory)	External (Theory)	Internal (Practical)	External (Practical)	Credit
*GEN 301	Value Education And Human Rights	Generic	Theory	20	80	--	--	6
GEN 302	Safe Laboratory Practices	Generic	Theory	20	80	--	--	6
BMLT 303	Introduction to Parasitology and Medical Entomology	Skill	Theory & Practical	10	40	10	40	6
BMLT 304	Fundamentals of Microbiology	Skill	Theory & Practical	10	40	10	40	6
BMLT 305	Bacteriology, Mycology and Virology	Skill	Theory & Practical	10	40	10	40	6
SEMESTER IV								
*GEN 401	Environmental Studies	Generic	Theory	20	80	--	--	6
GEN 402	Clinical Laboratory Management	Generic	Theory	20	80	--	--	6
BMLT 403	Introduction to Histopathology	Skill	Theory & Practical	10	40	10	40	6
BMLT 404	Introduction to Cytopathology	Skill	Theory & Practical	10	40	10	40	6
BMLT 405	Microbiology-I	Skill	Theory & Practical	10	40	10	40	6
**SIT-401	Summer Industrial Training							6

*Refer to Generic Components Common to all B.Voc. Courses

** Summer Industrial Training of 4-6 weeks in a relevant Industry after 4th Semester Examinations during summer break. Training report by the student to be submitted within in one week of start of 5th Semester. Viva-Voce examination to be held within 3-weeks of the start of 5th semester.

Job Role: Medical Lab Technician

B.Voc. (Medical Lab Technology) SEMESTER V

Semester V								
Paper Code	Title	Generic/Skill Component	Theory/Practical	Internal (Theory)	External (Theory)	Internal (Practical)	External (Practical)	Credit
*GEN - 501	Critical Thinking and Elementary Statistics	Generic	Theory	20	80	--	--	6
502	Introduction to Biochemical Techniques	Generic	Theory	20	80	--	--	6
503	Introduction to Immunology	Skill	Theory & Practical	10	40	10	40	6
504	Serology : Introduction & Serological Lab Procedures	Skill	Theory & Practical	10	40	10	40	6
505	Clinical Biochemistry-I	Skill	Theory & Practical	10	40	10	40	6
<p>Note: Winter Industrial/ In-house Training of 2-3 weeks in a relevant area after 5th Semester Examinations in winter break.</p>								
SEMESTER VI								
*GEN 601	Entrepreneurship Development Programme	Generic	Theory	20	80	--	--	6
602	Sensitization to Blood Banking and Infection Control	Generic	Theory	20	80	--	--	6
603	Microbiology -II	Skill	Theory & Practical	10	40	10	40	6
604	Clinical Biochemistry-II	Skill	Theory & Practical	10	40	10	40	6
605	Haematology	Skill	Theory & Practical	10	40	10	40	6
**SIT- 601	Summer Industrial/ In-house Training and Comprehensive Viva	Skill	Practical	10	40	10	40	6

*Refer to Generic Components Common to all B.Voc. Courses

**Winter Industrial/ In-house Training of 2-3 weeks done after 5th Semester Examinations and before start of 6th semester. Training report by the student to be submitted within in one week of start of 6th Semester. Viva-Voce examination to be held within 3-weeks of the start of 6th semester.

Job Role:Medical Lab Technician

B.Voc MLT SEMESTER I
BMLT Skill 103
BASICS OF HUMAN ANATOMY
Credits 6

Objectives: Basic understanding of organization of body cells, tissues, organs, organ systems, and glands in human body

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Basic unit of body - Cell
 - The anatomical organization of body cells, tissues, organs, organ systems, membranes and glands in human body.
 - Introduction to different types of tissues: Anatomy, epithelial tissue, muscular tissue, nervous tissue
- Different types of organ systems.
Brief Introduction of different types of body fluids ,secretions and excretions
- Skeletal system: bones, joints and muscles.

Section II

Digestive Organs:

- Tongue
- Teeth
- Oral cavity
- Pharynx
- Oesophagus
- Stomach
- Small intestine
- Large intestine
- Liver, Pancreas and Spleen

Section III

Respiratory Organs:

- Nasopharynx
- Oropharynx
- Larynx
- Trachea
- Bronchi
- Lungs
- Thoracic cavity
- Pleura and Pleural cavity

Circulation System: Structure of Heart and Brief introduction of main blood vessels.

Section IV

Reproductive Organs Male and Female Gonads

Nervous system and Sense organs : Brief Introduction of Central Nervous System and Peripheral Nervous System

Anatomy of Brain , Spinal Cord,Nerves,Eye,Ear,Olfactory Receptors,Gustatory Receptors

Excretory Organs:

- Cortex and medulla of Kidney
 - Ureter
 - Urinary Bladder
- Urethra (male and female)

PRACTICAL: Study of various organs through Charts and models

Reference Books:

- | | |
|--|--------------------------|
| ➤ Anatomy & Physiology: | Ross and Wilson |
| ➤ Anatomy and Physiology: | N Murgesh |
| ➤ Anatomy and Physiology for nurses: | Evelyn Pearce |
| ➤ Anatomy and Physiology for nurses : | Sears |
| ➤ Anatomy and Physiology for nurses : | Pearson |
| ➤ Human Anatomy: | Harie R. Berasari |

B.Voc MLT SEMESTER I
BMLT SKILL 104
INTRODUCTION TO LABORATORY EQUIPMENTS
Credits 6

Objectives:

- To gain broad understanding of care of laboratory glassware, equipment and instrument
- To gain broad understanding of setting up, calibrating, operating, cleaning, maintaining, troubleshooting of laboratory equipment used in quantitative or qualitative analysis
- To Calibrate and Validate the Clinical Laboratory instruments and glass wares
- To understand Microscopy, working principle, maintenance and applications of various types of microscopes

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

Brief understanding of laboratory planning and laboratory key learning outcome operations.

Introduction to operation and safety precautions of common Laboratory Equipments

Principles and working of laboratory instruments Incubator, Hot Air Oven, Water Bath , Anaerobic Jar, Centrifuge, Autoclave, burettes & pipettes ,colorimeter neubauer's Chamber Setting up, calibrating and validating, operating, cleaning, maintaining, troubleshooting of laboratory equipment used in quantitative or qualitative analysis
Autoclave – its structure, functioning, control and indicator Micrometry

Section II

- Techniques of Disinfection
- Sterilization : Definition, Classification and General Principle of Sterilization, Sterilization Techniques, Sterilization of rubber goods, laboratory equipment & other instruments
- The cleaning and maintenance procedures of the machine
- Identify the cause of errors or other problems or defects in equipments
- Glassware – Description of Glassware, its use, handling and care
- Importance and methods of cleaning of glass apparatus
- Calibration of apparatus and glasswares

Section III

- To study the compound microscope and its parts
- Microscopy, working principle, maintenance and applications of various types of microscopes:-
 - Dark ground microscope.
 - Polarizing microscope.
 - Phase contrast microscope.
 - Interference microscope.
 - U.V. light microscope.

SECTION IV

- Microscopic examination of micro-organism, bright field microscopy, dark field microscopy, phase contrast microscopy, electron microscopy.
 - Electron microscope: working principle, components and allied techniques for electron microscopy, ultra-microtomy Care and handling of various microscopes-Binocular, DGI, Phase-contrast, fluorescence and electron microscopes
- Museum techniques
- Lab safety and Instrumentation

Reference Books

- At the Bench : A Laboratory Navigator Kathe Barker
- At the Helm : A Laboratory Navigator Kathe Barker
- Basic Medical Laboratory techniques Barbara H. Estridge et al
- Instrumental Analysis Chatwal Anand
- Laboratory Reference Jane Roskams
- Medical Dictionary Oxford
- Medical Informatics Mohan Bansal

B.Voc MLT SEMESTER I
BMLT Skill 105
INTRODUCTION TO HEMATOLOGY
Credits 6

Objectives:

To gain understanding of blood and components of blood To gain knowledge of hematological Diseases and hematological Investigations.

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Introduction to hematology and laboratory organization Composition and functions of blood, and lymph.
- Detailed study of Haemoglobin and its functions of hemoglobin
- Blood groups including Rh. Factor
- Detailed study of Reticulocytes
- Formation of blood. Morphology of normal blood cells and their identifications
- Hemostasis , Mechanism of blood coagulation. Fibrinolysis.

Section II

- Various anticoagulants, their uses, mode of action and their merits and demerits. Normal and absolute in haematology. Quality assurance in hematology

Section III

- Descriptive study of RBC abnormalities, Disorders related to RBC Normal white cell count & physiological variation Normal white cell count & physiological variation Hematological Diseases: Anemia and various types of anemia, Thalassemia, Polycythemia, hemolytic disease of new born, multiple myeloma, parasitic infections of blood Leukemia: definition and classification (General & FAB).

Section IV

- Laboratory Investigation & Bleeding Disorders Laboratory preparation for coagulation tests Routine coagulation tests, prothrombin time , plasma recalcification time ,partial thromboplastin time , activated partial thromboplastin time, thrombin time, Laboratory diagnosis of bleeding disorders .

PRACTICALS

1. Cleaning of Laboratory glassware in hematology
2. Clinical significance ,specimen collection, laboratory investigation & preservation of blood for various hematological investigations .
3. Preparation of blood smear.
4. Haemocytometry, procedures for cell counts-visual as well as electronic
5. Total leukocyte count and Differential leukocyte count.
6. Determination of total erythrocyte(RBC) count and platelet counts. Errors involved and mean to minimize such errors. .
7. Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for adaptation for Hb estimation.
8. Romanowskydyes , preparation and staining procedures of blood smears.
9. Laboratory tests for assessing bleeding disorders

Reference Books

- Atlas of haematology (5/e) G.A. McDonald
- Clinical Haematology Christopher A. Ludlam
- Practical Haematology J.B. Dacie
- Practical Haematology (8/e) S ir John
- Haematology (International edition) Emmanuel C.Besa
- Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M. Robinson
- Haematology for students Practitioners Ramnik Sood
- Hand book of Medical Laboratory Technology (2/e) V.H. Talib

Objective:

- **To Understand about Healthcare Service Providers**
- **To develop broad understanding of the Role of MLT**
- **To Understand Patient's Rights & Responsibilities**

Instructions-

- **The syllabus of this paper has been divided into four units.**
- **Examiner will set a total of nine questions comprising two questions from each unit,**
- **Question number one is compulsory of short answer type questions covering the whole**
- **syllabus.**
- **The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.**
- **All questions carry equal marks**

Section I

Introduction to medical technology

- **Healthcare Systems, Laboratory and Delivery System**
- **Health care service provider(primary, secondary & tertiary)**
- **Understanding of Hospital Functions**
- **Understanding of Diagnostic Centers and medical laboratory facilities**
- **Understanding of Laboratory at different level (National / State / District)**
- **Role of Medical Laboratory Technician**
- **maintenance needs to be taken care by MLT**
- **Understanding of Laboratory Test Results**

Section II

- **Use of laboratory related medical terminology in daily activities with colleagues, patients and family**
- **Monitor and assure quality and quality assurance program**
- **Organisations' policies and commitments towards quality assurance**
- **Ethical Behavior**
- **Patient's Rights & Responsibilities, Patient Comforts and Safety**
- **Sensitivities involved in patient's right**
- **Understanding of Patient Comforts and Safety**
- **Medical laboratory technician's role in maintaining patient's rights**

SECTION III

Patient's Environment

- **Maintain a safe, healthy, and secure working environment**
- **Importance of health, safety, and security in the workplace**
- **Common Hazard**
- **Create safety records and maintaining them**
- **Organisational structure and the various processes related to reporting and monitoring**
- **Procedure for accessing training, learning and development needs**
- **To make the patient feel safe and comfortable while collection**
- **Impact of comfort on patients health**

SECTION IV

Personal Hygiene

- **Importance and methodology of cleanliness, and hygiene environment in collection space**
- **Concept of Healthy Living**
- **Understanding & procedures of healthy Hygiene**
- **Techniques of Grooming**
- **Techniques of Use of PPE**
- **Vaccinations against common infectious diseases**

Reference Books

- **A Manual of Laboratory & Diagnostic Tests (6/ e) Frances Fischbach**
- **Hand book of Medical Laboratory Technology (2/e) V.H. Talib**
- **Clinical Diagnosis & Management by Laboratory method0 (20/e) John Bernard Henary**
- **Textbook of Medical Laboratory Technology Godkar and Godkar**

SEMESTER II

B.Voc MLT

Paper - Skill BMLT 203 BASICS OF PHYSIOLOGY

Credits 6

Objectives: Basic understanding of physiology of different organ system of body.

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Nutrition- Different types of Nutrients and Vitamins
- Integumentary system: Structure of Skin and its functions.
- Digestive system: Physiology of digestion of food and its absorption.

SECTION II

- Lymphatic system: Different types of body fluids and their functions
- Spleen, lymph node and R.E. system
- Excretory System : Urine formation, osmoregulation and counter current mechanism.
- Cardiovascular system : Origin and regulation of heart beat, cardiac cycle, electrocardiogram, cardiac output, blood pressure and micro-circulation.

SECTION III

- Respiratory system- Transport of O₂ and CO₂, Oxygen dissociation curve of haemoglobin, Bohr effect, chloride(-) shift, Haldane effect
- Muscular System : Ultrastructure and physiological basis of skeletal muscle contractions.
- Reproductive System- Brief Introduction to Female Reproductive System and Male Reproductive System
- Fertilization and Gametogenesis.

SECTION IV

- Neural Physiology- Structure of neuron, resting membrane potential, origin and propagation of impulse along the axon, synapse and myoneural junction.
- Endocrine System- Structure, and functions of hormones of thyroid, parathyroid, adrenal, pineal, hypothalamus, pituitary, pancreas, gonads, thymus.
- Hormones of alimentary canal and kidney.

PRACTICAL

- Study of systems mentioned in theory through Charts.
- To separate the plasma and serum from given blood sample
- Study of various endocrine glands through permanent slides

Reference books

- Textbook of Medical Physiology Guyton and Hall
- Anatomy & Physiology Ross and Wilson
- Anatomy and Physiology N Murgesh
- Anatomy and Physiology for nurses Evelyn Pearce
- Anatomy and Physiology for nurses Sears
- Anatomy and Physiology for nurses Pearson
- Anatomy and Physiology: Understanding the Human Body Clark
- Physiology & Health Education Gandhi & Goel
- Endocrinology Headley
- Human Physiology Andrew Davis
- Manual of Endocrinology and Metabolism Norman Levin

Objectives: To gain elementary knowledge of Biochemistry

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Elementary Knowledge of Inorganic Chemistry: Structure of atom, atomic weight, molecular and equivalent weight. Acids, bases and salts. Acid Base Balance, pH, pH indicators pH-measurement (pH meter, pH paper, universal indicator). Normality, Molarity and Molality, Mole, Molar solutions, normal solutions, buffer solutions, percent solutions, saturated solutions, standard solutions
- Radio isotopes and their use in Biochemistry

Section II

- Elementary Knowledge of Organic Chemistry: Organic compounds, aliphatic, aromatic, alcohol, ethers, phenols, acids, etc.
- Elementary Knowledge of Physical Chemistry- Osmosis, osmotic pressure, dialysis, surface tension, diffusion, hypotonic, hypertonic and isotonic solutions. Definition and classification of some colloids and crystalloids.

Section III

- Elementary Knowledge of Analytical Chemistry: : balances,- monopan, twopan, toppan, centrifuges, pH meter, colorimeter, spectrophotometer, fluorimeter, flame photometer, ion selective electrodes, urinometer, chromatograph, electrophoresis, densitometer.
- Basic Steps of Analytic Techniques titrimetry photometry, Electrochemistry, Immuno - chemistry

Section IV

- Introduction, and properties of carbohydrates, proteins and fat.
- Introduction and general properties of Nucleic acids and Enzymes
- Elementary knowledge of Minerals, Electrolytes and hormones
- Therapeutic Drug Monitoring
- Metabolism of carbohydrates, proteins and fat.

Practical

1. Preparation and storage of distilled water
2. Preparation of laboratory reagents and standard solutions, storage of chemicals.
3. Units of measurements. S.I. Units, measurement of volume, volumetric apparatus.(pipettes, flasks, Cylinders)
4. Calibration of volumetric apparatus.
5. Preparation and standardization of volumetric solutions
6. Preparation of buffer solution and measurement of their pH
7. Verification of Beer Lamber's Law
8. To prepare different bulbs required in the laboratory
9. To prepare the different concentration of solutions
10. To prepare of the 1/10 N HCL
11. To determine the nature of the given solution
12. To find out the normality of given solution

REFERENCE BOOKS

- A guidebook to Biochemistry Michael Yudkin
- A Manual of Laboratory & Diagnostic Tests (6/ e) Frances Fischbach
- Biochemistry Voet and Voet
- Biochemistry Stryer
- Biochemistry U. Satyanarayan. & U. Chakrapani
- Clinical Biochemistry Richard Luxton
- Clinical Diagnosis & Management by Laboratory method0 (20/e) John Bernard Henary
- Clinical Biochemistry G. Guru
- Handbook of Biochemistry M.A. Siddique
- Textbook of Medical Biochemistry S. Ramkrishnan

- **Biochemical Techniques K. Choudhary**
- **Text book of Medical Biochemistry Chaterjee & Shinde**
- **Principles of Biochemistry David L. Nelson**
- **Principles of Biochemistry Lehninger**
- **Textbook of Biochemistry and Human Biology G.P. Talwar**
- **Textbook of Medical Laboratory Technology Godkar and Godkar**
- **Outline of Biochemistry Conn Stumpf**
- **Principles of Internal Medicine Isselbacher**
- **Proteins and Proteomics : Laboratory Manual Richard J. Simpson**
- **Purifying Proteins for Proteomics: Laboratory Manual Richard J. Simpson**
- **Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001) Palmer Trevor, Publisher: Horwood Pub. Co., England.**
- **Outlines of Biochemistry: 5th Edition, Erice Conn & Paul Stumpf ; John Wiley and Sons, USA**
- **Fundamentals of Biochemistry. 3rd Edition (2008), Donald Voet & Judith Voet , John Wiley and Sons, Inc. USA**
- **Lehninger, Principles of Biochemistry. 5th Edition (2008), David Nelson & Michael Cox, W.H. Freeman and company, NY.**
- **Biochemistry: 7th Edition, (2012), Jeremy Berg, Lubert Stryer, W.H.Freeman and company, NY**
- **Biochemical Methods for Agricultural Sciences – Sadasivam and Manikam. Wiley Eastern Limited, 1992..**
- **Practical Clinical Biochemistry Harold Varley, CBS; 6 edition (1 December 2006)**
- **An Introduction to Practical Biochemistry (3rd Edition) – David T Plummer. Tata McGraw-Hill Publishing Company Limited, 1992.**
- **Biometrics Identity by Sameer Nanawati**
- **Medicinal Chemistry by AshutoshKar**

SEMESTER II

B.Voc MLT

Skill BMLT 205 Paper - Analytical Laboratory Testing Process-I

Credits 6

Objectives: To gain broad understanding of chemicals/reagents useful in sample analysis. To gain broad knowledge of Routine Hematological Tests and Urine tests, Stool tests, Semen tests and sputum tests

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Collection and recording of biological specimens, Collection, Handling and transportation of Blood Sample,
- Correct method of blood sample collection, Collection methods of samples other than blood samples.
- Routine Hematological Tests :
- Examinations of sample for serum Urea and Uric acid Estimation of Essential electrolytes: Sodium, potassium, calcium, chloride and phosphorus etc.
- Determination of blood sugar level of plasma (or serum) (a) Orthotoluidine method, (b) Glucose oxidase method
Determination of the serum urea nitrogen (a) Diacetyl monoxime method Determination of serum creatinine : Alkaline picrate method Determination of serum total cholesterol

SECTION II

- Determination of serum bilirubin a. Malloy and Evelyn b. DMSO method
- Determination of TSH Laboratory investigation for megaloblastic anaemia
- Laboratory investigation for iron deficiency Anaemia
- Laboratory investigation for haemolytic anaemia including classification and causes
- Laboratory investigation for disseminated intravascular coagulation (DIC)
- Mechanism of fibrinolysis test for fibrinolysis Platelet function tests and their interpretation

SECTION III

- Erythrocyte sedimentation rate, factors influencing ESR and various procedures for its estimation with their significance. Haematocrit value by macro and micro methods their merits and demerits. Determination of packed cell volume (PCV) Physiological variations in HB, PCV, TLC and platelets
- Determination and calculation of red blood indices MCH, MCHC, MCHC
- Determination of absolute Eosinophil count and Reticulocyte count
- Determination of hematocrit, Enumeration of formed elements, Automated systems in hematology

SECTION IV

Urine Examination

- Collection, Handling, transportation of Urine
- Examination of Urine.
- Urine analysis, routine examination of urine (physical examination of urine) rapid chemical tests of Urine
- Determination of specific gravity of urine by urinometer and refractometer
- Microscopic examination of urine
- Clinical significance and Detailed Examination of Urine
- Biochemical Test Profile (Quantitative determination of Urine)
- Amylase, Calcium, Chlorides, Creatinine, Sodium, Potassium, Glucose, Proteins, Urea nitrogen, uric acid bile pigments, ketone bodies, porphobilinogen, faecal occult blood.

Practicals- All Biochemical tests mentioned in Theory

Reference Books

- **Textbook of Medical Laboratory Technology Godkar and Godkar**
- **Research Methodology in Medical Sciences Chandorkar**
- **Practical Clinical Biochemistry Harold Varley**
- **Medical Laboratory Sciences, Theory & Practical A. Kolhatkar**
- **Medical Laboratory Technology – Volume I Kanai Mukherjee**
- **Medical Laboratory Technology – Volume II Kanai Mukherjee**
- **Medical Laboratory Technology – Volume II Kanai Mukherjee**
- **Medical Laboratory Technology Methods & Interpretation (5/e) Ramnik Sood**
- **Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001) Palmer Trevor, Publisher: Horwood Pub. Co., England. Outlines of Biochemistry: 5th Edition, Eric Conn & Paul Stumpf ; John Wiley and Sons, USA**
- **Fundamentals of Biochemistry. 3rd Edition (2008), Donald Voet & Judith Voet , John Wiley and Sons, Inc. USA**
- **Lehninger, Principles of Biochemistry. 5th Edition (2008), David Nelson & Michael Cox, W.H. Freeman and company, NY.**
- **Biochemistry: 7th Edition, (2012), Jeremy Berg, Lubert Stryer, W.H.Freeman and company, NY**
- **Biochemical Methods for Agricultural Sciences – Sadasivam and Manikam. Wiley Eastern Limited, 1992..**
- **Practical Clinical Biochemistry Harold Varley, CBS; 6 edition (1 December 2006)**
- **An Introduction to Practical Biochemistry (3rd Edition) – David T Plummer. Tata McGraw-Hill Publishing Company Limited, 1992**

SEMESTER III
B.Voc. (Medical Lab Technology)

PAPER GENERAL BMLT 302 SAFE LABORATORY PRACTICES

Credits:6

Objectives:

- To develop understanding and precautions to ensure Patient's Safety
- Describe basics of first aid
- To develop understanding and precautions to ensure self-safety.
- To gain understanding of importance of proper and safe disposal of bio-medical waste & treatment
- To gain Elementary knowledge on Good Clinical Laboratory Practices

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

Safety & First Aid

- Human health and Homeostasis, medical care in India, Medical Laboratories of developing countries
- Basic causes of accidents, common types of laboratory accidents
- Ethics, responsibility ,safety measure,
- Basics of first aid precautions to ensure self-safety
- Sample preservation and precautions while Transporting
- First aid in laboratory understanding and precautions to ensure Patient's Safety
 - Common emergency conditions and what to do in medical emergencies
 - Basics of first aid

Section II

Biomedical Waste Management-I

- Biomedical waste management in a clinical laboratory :
- Disposal of used samples, reagents and other biomedical waste e: Importance of Biomedical Waste.
- Categories of bio-medical waste
- Disposal of biological samples material.
- Bio-medical waste – color coding, types of containers, transportation of waste
- Disposal of Laboratory waste, Means of bio-medical waste treatment, NABL and SOP
- Categorize waste according to national, local and organizational guidelines
- Appropriate approved disposal routes for waste
- Appropriate containment or dismantling requirements for waste
- How to make the waste safe for disposal

Section III

Biomedical Waste Management-II

- Organizational and national waste management principles and procedures
- Hazards and risks associated with the disposal and the importance of risk assessments and how to provide these
- Personal protective equipment required to manage the different types of waste generated by different workactivities
- Actions and reporting procedures for any accidents, spillages and contamination involving waste
- External agencies involved in the transport and receipt of your waste
- Importance of segregating different types of waste and how to do this
- Safe methods of storage and maintaining security of waste and the permitted accumulation times
- Current national legislation, guidelines, local policies and protocols which affect work practice

Section IV

Best Practices in Lab

- Sensitization on current best practices in laboratory
- Elementary knowledge on Good Clinical Laboratory Practices (GCLP) of WHO
- Elementary Knowledge of laboratory safety guidance of OSHA (Occupational Safety and Health Administration), U.S. Department of Labor
- Elementary Knowledge of other current practices in laboratory used worldwide.

Reference Books

- Kanai L. Mukherjee & Swarajit Ghosh (Eds) Medical Laboratory Technology, Vol. I: Procedure Manual for Routine Diagnostic Tests
- Mukherjee, McGraw-Hill Education Med Lab. Technology, Volume 1
- F. J. Baker, R. E. Silverton : Introduction to Medical Laboratory Technology
- Tao Le and Vikas Bhushan First Aid for the USMLE Step 1 2017
- Rajeev Sharma : First Aid Guide

- American Red Cross (Author), Kathleen A. Handal - The American Red Cross First Aid and Safety handbook Paperback – Import, 27 May 1992
- Dan Wolfe - Smashwords , 2014 :First Aid and Beyond
- Ronald A. Bergman - Anatomy Atlases , 2004: Anatomy of First Aid: A Case Study Approach
- www.osha.gov/Publications/complinks/OSHG-HazWaste/all-in-one.pdf
- <http://www.ochs.org.uk/sites/default/files/health-and-safety.pdf>
- http://www.hsa.ie/eng/Publications_and_Forms/Publications/Safety_and_Health_Management/Workplace_Safety_and_Health_Management.pdf
- <http://www.hse.gov.uk/pubns/indg449.pdf>
- First Aid Manual 9th Edition St John Ambulance
- BMW% 20Rules, % 202016_1.pdf

Objectives: To Understand the role of parasites and vectors in disease transmission, and the most appropriate control strategies.

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole Syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- General characters and classification of protozoa of medical importance.
- Morphology and life cycles of intestinal Protozoa-Amoebae-Giardia.
- Laboratory diagnosis of intestinal protozoal infection:- Amoebae-Giardia
- Morphology and diagnosis of oral and vaginal flagellates -Trichomonas, - E.gingivalia
- Morphology and life cycle of Haemoprotozoa - Malarial Parasite - Laboratory diagnosis of Malarial infection

SECTION II.

- Morphology and life cycles of Nematodes (Intestinal) -Ascari -Enterobions - Ancylostoma -Strongyloides- Laboratory diagnosis of intestinal Nematode infection.
- Morphology and life cycle of Haemoflagellates. -Leishmania-Trypanosomes, Laboratory diagnosis of Leishmania, Trypanosomes.
- Morphology and life cycle of tissue and blood nematodes –Filaria –Trichinella-Dracunculus
- Lab. Diagnosis of tissue & blood nematode infection. Morphology and life cycle of intestinal cestodes -Taenia-Echinococcus -H.nana-D. latum
- Laboratory diagnosis of cestode infection -Hydatid-Cysticercosis
- Life cycle, pathogenic, mechanisms and control of parasitic infections viz. amoebiasis, Kala-azar, toxoplasmosis, ascariasis, filarasis, hook worm infections.

SECTION III

- Culture techniques for protozoa amoeba, Giardia, Leishmania
- Culture methods for Helminths Hookworm round worm.
- Egg counting techniques.
- Preparation of stains and staining procedures of malaria.
- Identification of different plasmodium species.
- Preparation of media and maintenance of cultures of E. histolytica.-Giardia -Leishmania
- Culture methods for helminthes
- Putting up Casoni's test and its interpretation.
- Examination of hydatid cyst and processing for preparation of antigen for Casoni's Test.
- Examination and processing of Cysticercosis cyst.

SECTION IV

- Introduction to Entomology Identification of Adultworms- mosquitoes, flies, ticks and fleas
- Animal care, handling and uses in parasitology.
- Preparation of parasitic antigens, antisera and antisera
- Handling and operating of sophisticated equipment
- Laboratory processing, staining and examination of samples

PRACTICALS:

- 1. Introduction to operation of laboratory instruments and safety precautions.**
- 2. Macroscopic examination of adult worms, cysts, tissues and processing of stool sample for routine examination.**
- 3. Saline preparation for protozoan cysts and trophozoites.**
- 4. Concentration procedures for helminthic ova and cyst. Examination and identification of ova and cyst of parasites of medical importance.**
- 5. Study of malarial parasite.**
- 6. Laboratory diagnosis of kalaazar.**
- 7. Detection of trypanosomes(the causal agent of sleeping sickness)**
- 8. Laboratory diagnosis of microfilaria(Wuchereria bancroftii)**
- 9. Quantitative determination of serum (or plasma) igG class antibodies to toxoplasma gondii by ELISA**
- 10. Determination of IgM class antibodies to toxoplasma gondii by ELISA**

Reference Books

- **Human Parasitology: By (author) Burton J. Bogitsh , By (author) Clint E. Carter , By (author) Thomas Oeltmann 4th Revised edition Publication City/Country San Diego, United States Publisher Elsevier Science Publishing Co Inc.**
- **Clinical Parasitology : A Practical Approach 2nd edition Elizabeth A. Zeibig Publisher Elsevier - Health Sciences Division**
- **Veterinary Parasitology M. A. Taylor , By (author) R. L. Coop , By (author) R. L. Wall John Wiley and Sons Ltd,3rd revised edition**
- **Medical Entomology: A Textbook on Public Health and Veterinary Problems Caused by Arthropods 2nd Edition by B.F. Eldridge (Editor), John Edman (Editor)**
- **Medical and Veterinary Entomology, Second Edition 2nd Edition by Gary R. Mullen (Editor), Lance A. Durden (Editor)**
- **Medical Entomology for Students 3rd Edition by Mike Service (Author)**
- **Text book of Medical Lab Technology, Praful B. Godkar and Darshan P Godkar, Publisher Bhalani Publisher, Third edition Vol 1-3**

PAPER Skill BMLT 304:FUNDAMENTALS OF MICROBIOLOGY**Credits:6****Objective: To give an overview of various aspects of General microbiology**

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Introduction and brief History, development, scope and applications of Microbiology.
- Nature of Microbial World : Prokaryotes and eukaryotes, growth pattern in microbes
- Morphology and Structure of Microorganisms
- Biotransformation of (a) D-Sorbitol to L-Sorbose. (b) Antibiotics.(c) Steroids
- Growth and nutrition of microbes
- Safety measures in microbiology.

SECTION II

- Morphology ,General characteristics & fine structure of bacteria, fungi, actinomycete and algae
- Classification of bacteria.
- Organization of cell wall, cell membrane, flagella and capsules in bacteria.
- Morphogenesis in bacteria, formation of spores and cysts.
- Bacteriophages : Morphology, multiplication, detection and enumeration.

SECTION III

- General characteristics actinomycete and algae
- Morphology ,General characteristics and classification of pathogenic fungi.
- Classification and general properties of Viruses
- Morphology,Pathogenicity and laboratory diagnosis of human viruses.

SECTION IV

- Methods of Microbiology isolation of pure cultures, theory and practice of sterilization.
- Staining of microbes, Theory of Gram staining.
- Preparation, uses and standardization of culture media.
- Principles of staining methods and preparation of reagents.
- Principles and methods of sterilization.
- Uses and mode of action antiseptics and disinfectants.

PRACTICALS:

Use of microscope in examination of unstained bacteria, fungi, algae, parasites and stained cell preparations including simple staining,

Gram's staining, acid fast staining, capsule staining, spore staining using prokaryotic and eukaryotic cells, hanging drop preparation.

Preparation of culture media, spread plates, pour plates, selective media, differential media

Separation of pure cultures and study the effect of selective nutrients on prokaryotes

Reference Books

- **Mims' Medical Microbiology** Richard Goering , Hazel Dockrell , Mark Zuckerman , Ivan M. Roitt , Professor Peter L. Chiodini Publisher Elsevier Health Sciences
- **Anantharyans and Paniker's Text book of Microbiology** edited by CKJ paniker 7th edition,Publisher Orient Longman
- **Roitt's Essential immunology** Delves, Peter J.,Martin, seamus J.Burton,Dennis R.Roitt, Ivan M Ananthanarayan and Paniker's Textbookof microbiology Kapil , arti ed
- **Microbiology: an Introduction**,12th edition Gerard J. Tortora Berdell R. Funke and Christine L. Case
- **Parasitology** Chatterjee K.D.
- **Microbiology** Pelczar, Michal J and Others
- **Medical microbiology** Greenwood David and Other
- **Ananthanarayan and Panikar's text book of Microbiology** Arti kapil
- **Immunology** Male David and Other
- **Mackie and Mc Cartney practical Medical Microbiology** Collee J.G and Other
- **Bailey and Scott's Diagnostic Microbiology**,13th edition Patricia Tille
- **Sherris Medical Micrbiology** , 6th edition Pottinger, L. Barth Reller and Charles R. Sterling
- **Stephenson Calculations for Molecular Biology**
- **Gerald Karp Cell Molecular Biology**
- **Stanier General Microbiology**

PAPER Skill BMLT 304 : Bacteriology, Mycology and Virology

Credits-6

Objectives:

- To learn the techniques of collection of samples, their processing and the identifications of the various pathogens, like bacteria, parasites, viruses, using different techniques.
- To provide vigorous training in the use of standard safety measures while handling highly infected material.
- To provide basic knowledge of the different diseases caused by various microorganisms is also imparted.

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I**IDENTIFICATION OF BACTERIA:**

- Micrococci, Staphylococci, Streptococci, pneumococci, Corynebacteria, Escherichia, Klebsiella,
- E-coli, Enterobacter, Proteus- providencia Salmonella, Shingella, Arizona, Citrobacter, Yersinia,
- Pseudomonas, Vibrio, Haemophilus, Mycoplasma, Ricketssia, Chalmidia, Tricragents.
- Introduction to important diseases caused by Streptococcus, Pneumococcus, Neisseria, Corynebacterium, Bacillus ,Clostridium tetani, Clostridium perfringens, enterobacteriaceae (Proteus, Shigella, Salmonella), Vibrio cholerae, Yersinia, Hemophilus, Mycobacterium, The operative pathogenic mechanisms, laboratory diagnosis, prevention and control of these diseases.
- Systematic grouping of pathogenic bacteria.
- Laboratory identification of infectious agents, Diagnosis of anaerobic infections ,identifying characteristics of common pathogenic bacteria,Antimicrobial susceptibility test. IMViC, Urease, catalase, geletineliqification, coagulase, oxidase, sugar fermentation, antibiotic sensitivity test.

Section II**PATHOGENIC AND NEW-PATHOGENIC FUNGI:**

- Introduction to Human mycotic infections viz Cryptococcosis, Dermatophytosis, Blastomycosis, Opportunistic Mycosis; Candidiasis and Aspergillosis.
- Candida, Cryptococci, Dermatophytes, Sporotrichoums, Histoplasma, Blastomyces, Coccidioides, Para-coccidioides, Dematiaceous fungi, Mycetoma, Actinomyces, Nocardia and common laboratory contaminants. Biochemical tests used for identification of bacteria and fungi.
- Antimicrobial sensitivity testing and assay methods for body fluids. Antimicrobial susceptibility testing for Mycobacteria. Preparation and standardization of antigens and antisera.
- Lab diagnosis of fungal infections Superficial dermatophyte fungal infections, Candidiasis, creptococosis, Pulmonary infections, Mycetoma, other deep mycotic infections, subcutaneous fungal infections subcutaneous fungal infections spozotrichosis, chromoblastomycosis, Eye and Ear fungi infections

Section III**VIROLOGY:-**

- Chemotherapy of Viral diseases, Oncogenic Viruses, RNA/DNA Viruses,AIDS, Miscellaneous viruses,
- Structure of viruses, lysogenic cycle, lytic cycle, smallpox, polio, HIV,Hepatitis B
- Morphology, pathogenesis, life cycle, laboratory diagnosis, prevention and control of viral diseases viz. Rabies, Polio, Small pox, Herpes, Measles, Influenza and AIDS
- Introduction to use of different laboratory instruments and their safety precautions.
- Collections, handling, and storage of samples for viral diagnosis.
- Washing, cleaning and sterilization of Media and glassware in Virology.

Section IV

- Principles of biosafety hoods use of pipettes, syringes and other virus contaminated
- Instruments in the laboratory. Mode of transmission of viral agents. Prevention of viral diseases. Immunity in viral infection
- Demonstration of preservation of viruses, viral antigens, infects biological materials and viruses.
- Different staining techniques used in virology.
- Use of Embronated eggs in clinical Virology.
- Principles of animal cell culture and their use in virology.

PRACTICALS:

1. Demonstration of staining procedures: Preparation of the following stains and demonstration of viral inclusion bodies:

a) Seller's stain for Negri body demonstration.

b) Giemsa Stain for CMV and Herpes viral inclusions.

2. Preparation of reagents for serological tests:

Phosphate buffered saline, Veronal buffered saline, Aalsever's solution, Dextrose gelatin, Veronal buffer and Tris buffer.

3. Principles and performance of viral haemagglutination and Haemagglutination inhibition test.

4. Demonstration of Haemadsorption test, IHA, and RPHA tests.

5. Demonstration of complement fixation test.

6. Demonstration of Immunofluorescence test and Immunoperoxidase test.

7. Demonstration of ELISA for HbsAg detection.

Reference Books

- Mims' Medical Microbiology Richard Goering , Hazel Dockrell , Mark Zuckerman , Ivan M. Roitt , Professor Peter L. Chiodini Publisher Elsevier Health Sciences
- Anantharyans and Paniker's Text book of Microbiology edited by CKJ paniker 7th edition, Publisher Orient Longman
- Roitt's Essential immunology Delves, Peter J., Martin, seamus J. Burton, Dennis R. Roitt, Ivan M Ananthanarayan and Paniker's Textbook of microbiology Kapil , arti ed
- Microbiology: an Introduction, 12th edition Gerard J. Tortora Berdell R. Funke and Christine L. Case
- Parasitology Chatterjee K.D.
- Microbiology Pelczar, Michal J and Others
- Medical microbiology Greenwood David and Other
- Ananthanarayan and Panikar's text book of Microbiology Arti kapil
- Immunology Male David and Other
- Mackie and Mc Cartney practical Medical Microbiology Collee J.G and Other
- Bailey and Scott's Diagnostic Microbiology, 13th edition Patricia Tille
- Sherris Medical Microbiology , 6th edition Pottinger, L. Barth Reller and Charles R. Sterling

Objectives:

- To Understand the importance and method of Observing and reporting while dealing with patients
- To Understand Guidelines for Collecting documentation
- To maintain restful environment

Instructions:

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole
- syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Organization of Laboratory
- Functional components of clinical laboratories,(cleanliness, precautions to be taken WRT patients ,reports, analysis
- Communication between physician ,patients, and the medical laboratory professional
- Basic needs of clinical laboratory technician, awareness of soft skills, KB1
- How to deal with various people.
- Principles and processes for providing customer and personal services including needs assessment techniques
- Quality service standards, alternative delivery systems, and customer satisfaction evaluation techniques

Section II

- Observing and reporting
- Quality control of clinical investigations, Automation in clinical biochemistry laboratory, laboratory organization
- Management and maintenance of records.
- Understand the importance and method of Observing and reporting while dealing with patients during sample and report collection
- The relevant legislation, standards, policies, and procedures followed in the Organization
- Role and importance of assisting other healthcare providers in delivering care
- Supervise and guide other laboratory personnel
- Manage people/patient effectively as per the guidelines.
- The principles of leadership and guidance.
- Importance and method of Observing and reporting while assisting the pathologists and other members of the team
- Importance of verbally informing the person in authority
- Research procedures and protocol:
- The process of generating or using different sets of rules to combine or group things in different ways

Section III

- Documentation
- Guidelines for documentation , Guidelines for Collecting documentation
 - Various types of records in laboratory set up
- Uses and importance of records in laboratory set up
 - Essential requirement of records
 - Understand abbreviations and symbols
 - Enter, transcribe, record, store, or maintain information in written or electronic/magnetic form
- Usage of LMIS(Laboratory information management system)

Section IV

- Professional Behavior in Healthcare Settings
- How to maintain restful environment , Business, mission, and objectives of the organization
 - General and Specific etiquettes to be observed on duty
 - Understand need for compliance of organizational hierarchy and reporting
 - legal and ethical issues
 - Importance of conservation of resources in laboratories
- Effective working relationships with the people ,The importance of planning, prioritizing and organizing work, Efficient use of time, Importance of keeping the work area clean and tidy

REFERENCE BOOKS

- Clinical Laboratory Management
Medical Laboratory Management
Biostatistics : A Foundation for Analysis in Health Sciences
Business Communication
Business English
English Vocabulary in Use
Business Letters, Emails
The Craft of Business Letter Writing
Presentations Laws
Telephoning and Teleconferencing Skills
Write to the Point : How to Communicate in business
with style and purpose
Commercial Correspondence and Office Management
Comdex Computer Course Kit
Computer Fundamentals
Excel 2010 Inside Out
Information Technology for Management
A Foundation Course in Value Education
Fundamentals of Ethics for Scientists & Engineers
Human Values, New Age International Publishers
Environment Biology
Environment Protection and Laws
Waste Water Treatment
Environment Science (1st Indian Edition)
Essentials of Environment Science
Environment Pollution Control Engineering
Perspectives in Environmental Studies
Practical Communication Skills
- Lynne Shore
Sangeeta Sharma et al
Wayne W. Daniel
Sinha, K. K.
Taylor, Ken.
Mccarthy, Micheal.
Shirley Taylor
Monipally, M. Matthew.
Anne
Ken Taylor
- Salvatore J. Iacone
R. S.N. Pillai
Gupta, V.
P.K. Sinha
Dodge, Mark
Lucas, Henry C.
R R Gaur, R Sangal, G P Bagaria, 2009
E G Seebauer & Robert L. Berry, 2000
A.N. Tripathy, 2003
Agarwal, K. C. 2001
Jadhav, H & Bhosale, V.M. 1995
Rao M. N. & Datta A.K. 1987
Daniel D. Chiras 2010
Joseph
Rao, C.S.
Kaushik, A.
Chrissie Wright

Objectives:

- Elementary knowledge of specimen collection
- Elementary knowledge of tissue fixatives
- Elementary knowledge of tissue processing :
- Logging of specimen, preparation of tissues , processing of tissues , Frozen section technique , Handling and embedding of small tissue fragments.
 - Understand about section cutting
 - Understand about Staining
- Staining Procedures
- Autoanalyzer, Tissue Processor, Microtome

- Elementary knowledge of Decalcification

Instructions: Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Introduction to histopathology and laboratory organization.
- Elementary knowledge of sample collection
- Reception, recording and labeling of histology specimens.

SECTION II

- Fixation and various tissue fixatives.
- Processing of histological tissues for paraffin-embedding.
- Embedding and embedding media.

SECTION III

- Microtome-various types, their working principle and maintenance.
- Microtome knives and knife sharpening.
- Practical section cutting, cutting faults and remedies.
- Routine staining procedures, mounting and mounting media.

SECTION IV

- Dye chemistry, theory and practice of staining.
- Solvents mordents, accelerators and accentuators.
- Uses of controls in various staining procedures.
- Metachromasia and metachromatic dyes.
- Haematoxylin stain. Its importance in histology.
- Carbohydrates and amyloid – special stains and procedures.
- Connective tissues trichrome staining and other special stains for muscle fibres, elastic, reticulin fibres and collagen fibres.
- Principles of metal impregnation techniques.
- Demonstration and identification of minerals and pigments
- Elementary knowledge of Decalcification

Practicals

1. Tissue processing by using tissue processor
2. Sharpening of the microtome knife
3. Gross examination and fixation of the specimen
4. Decalcification of calcified tissue
5. Processing of the tissue by manual method
6. Section cutting of paraffin wax embedded tissue
7. To fix the section on the slide
8. Staining of the tissue section by using hematoxylin and eosin staining method

Reference Books

- **Robbins Basic Pathology-Vinay Kumar , Abul K. Abbas , Jon C. Aster**
- **Histopathology Guy Orchard , Edited by Brian Nation Publisher Oxford University Press**
- **Text book of Histology,2nd edition,pal GP,Paras medical publisher.**
- **Histology for Pathologists by Stacey E Mills MD**
- **Sternberg's Diagnostic Surgical Pathology [2 - Volume Set] by Stacey E Mills MD**
- **Anatomic Pathology Board Review, 2e by Jay H. Lefkowitz MD**
- **Clinical Pathology Board Review, 1e 1 Har/Psc Edition**
- **by Steven L. Spitalnik MD (Author), Suzanne Arinsburg DO (Author), Jeffrey Jhang MD (Author)**
- **Medical Laboratory Science-Theory and Practice: J Ochei and A. Kolhatkar**
- **A Hand Book Of Medical Laboratory Technology By V.H.Talib**
- **Inderbir Singh's Textbook of Human Histology with Colour Atlas and Practical Guide by Vasudeva Neelam**
- **Medical Laboratory Technology : Methods and Interpretations Vol - 1 6th Edition by RAMNIK SOOD**

PAPER Skill BMLT 404 INTRODUCTION TO CYTOPATHOLOGY

Credits: 6

Objectives:

- To collect exfoliative cytology smears, contact smears and perform applications for cytological examination (under supervision) and carry out routine and special training procedure on cytology smears.
- To organize the histopathology laboratory of the above services and provide basic equipment maintenance.

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Cytoplasmic constituents and their demonstration
- Brief introduction of cytology and cytopathology
- Elementary knowledge of sample collection and transportation
- Exfoliative Cytology-Specimen Preparation
- Diagnostics Exfoliative cytology: Preparation of specimen
- Preparation of specimens for cytological evaluation
- Elementary knowledge of precautions to be taken for gynaecological samples
- Elementary knowledge of specimen collection, transportation and preservation of precautions to be taken for non gynaecological samples

SECTION II

- Exfoliative Cytology- Staining Techniques
- Diagnostics Exfoliative cytology: Cytological Stains and Staining Techniques
- Understanding of Fluid Specimen
- Cytological stains, Papanicolaou stain , other and special stains
- Staining techniques
- Mounting of cell sample

SECTION III

- Characteristics of benign and malignant cells
- Cervical cytology-basis of detection of malignant and premalignant lesions Hermorol assessment with cytologic techniques and sex chromatis and pregnancy tests.

SECTION IV

- Fine needle aspiration cytology (FNAC)
- Purpose of fine needle aspiration,
- Aspiration cytology principles, indications and utility of the technique with special emphasis on role of cytotechnician in FNAC clinics
- Procedure of fine needle aspiration and section cutting.
- Preparation for the procedure
- Educate the patient about procedure
- Calm down the anxious patients

Practicals

1. Cytochemical staining procedure in various haemopoietic disorders
2. Techniques available for cytogenetic studies
3. Use of Radioisotopes in hematology
4. Safety measures for handling Radioisotopes

Reference Books:

- **Practical Principles of Cytopathology Revised 1st Edition by Richard M. DeMay (Author)**
- **Diagnostic Cytopathology: Expert Consult: Online and Print, 3e 3rd Edition by Winifred Gray MB BS FRCPath (Author), Gabrijela Kocjan MD MB BS Spec Clin Cyt (Zagreb) FRCPath(London) (Author)**
- **Diagnostic Cytopathology Essentials 1st Edition Authors: Gabrijela Kocjan Winifred Gray Tanya Levine Ika Kardum-Skelin Philippe Vielh: Churchill Livingstone**
- **Diagnostic Cytopathology, 3rd Edition, Authors: Winifred Gray Gabrijela Kocjan Churchill Livingstone**
- **Diagnostic Cytopathology Essentials: Expert Consult: Online and Print Hardcover – 24 Jun 2013 by Kocjan (Author)**

Objectives:

- To learn the techniques of collection of samples, their processing and the identifications of the various pathogens, like bacteria, parasites, viruses, using different techniques.
- To provide basic knowledge of the different diseases caused by various microorganisms is also imparted, their processing and the identifications of the various pathogens, like bacteria, parasites, viruses, using different techniques.
- To provide training in the use of standard safety measures while handling highly infected material. To provide basic knowledge of the different diseases caused by various microorganisms is also imparted

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Physiology of bacteria, anatomy of bacterial cell, growth requirement of bacteria-growth curve, nutrients required. Gram positive & Gram negative Bacteria.
- Elementary knowledge of Pyogenic cocci, Gram Negative Bacilli, Gram Positive bacilli, anaerobes, mycobacteria and spirochetes.
- Difference between cocci & bacteria,
- Normal flora of human body.

Section II

- Lab diagnosis of common Bacterial infections viz:- pyogenic infections, Respiratory tract infections, Meningitis, Diphtheria,
- Whooping Cough, Gas gangrene, food poisoning, Enteric fever, Acute diarrhea diseases, cholera, Urinary tract infection,
- Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, syphilis, Gonorrhoea and other STD's.

Section III

- Disease oriented microbiology, culture & sensitivity test, aerobic, anaerobic techniques
- Introduction to Fungi and parasitic fungi, specimen collection, Laboratory diagnosis of mycotic infections, Diagnostic mycology
- Principles of Antigen-Antibody reactions.
- Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi.

Section IV

- Diagnostic Microbiology & Micro Techniques
- Role of microbiology laboratory, specimen handling, laboratory records, safety Regulations, Basic procedures of Diagnostic Rapid and automation methods in Diagnostic Microbiology, Culture environments of microbes, Quality control in microbiology, Quick reference of media and biochemical tests
- Collection and handling of faecal specimen, Laboratory techniques in parasitological investigation of stool, Processing of specimens other than stool, Lab identification of human parasites
- Collection, transportation and processing of clinical samples for microbiology investigations.

Practicals .

1. Preparation of Smear
2. Bacteriophage and Bacteriocine typing methods
3. Lab diagnosis of common Bacterial infections viz:- pyogenic infections, Respiratory tract infections, Meningitis, Diphtheria,
4. Whooping Cough, Gas gangrene, food poisoning, Enteric fever, Acute diarrhoea diseases, cholera, Urinary tract infection,
5. Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, syphilis, Gonorrhoea and other STD's
6. Monochrome staining (simple staining),
7. Gram's staining
8. Study of motility of capsule
9. Study of bacterial capsule
10. Study of acid fast bacilli
11. Isolation of bacteria by streak plate techniques
12. To perform qualitative widal test

Reference Books

- Mims' Medical Microbiology Richard Goering , Hazel Dockrell , Mark Zuckerman , Ivan M. Roitt , Professor Peter L. Chiodini Publisher Elsevier Health Sciences
- Roitt's Essential immunology Delves, Peter J., Martin, Seamus J. Burton, Dennis R. Roitt, Ivan M Ananthanarayan and Paniker's Textbook of microbiology Kapil , arti ed
- Microbiology: an Introduction, 12th edition Gerard J. Tortora Berdell R. Funke and Christine L. Case
- Parasitology Chatterjee K.d.
- Microbiology Pelczar, Michal J and Others
- Medical microbiology Greenwood David and Other
- Ananthanarayan and Paniker's text book of Microbiology Arti kapil
- Immunology Male David and Other
- Mackie and Mc Cartney practical Medical Microbiology Collee J.G and Other
- Bailey and Scott's Diagnostic Microbiology, 13th edition Patricia Tille
- Sherris Medical Microbiology , 6th edition Pottinger, L. Barth Reller and Charles R. Sterling

Objective: To get basic knowledge of Spectroscopic, Electrophoretic, Chromatographic and Radio Isotopic Techniques

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Spectroscopic Technique
- Spectroscopic Techniques: Beer-Lambert's Law. Light absorption and its transmittance. Determination and application of extinction coefficient. Applications of following spectroscopic techniques in elucidating structure of Biomolecules- Visible, U.V., infra-red and fluorescence spectroscopy. ORD, C.D. and N.M.R.

SECTION II

- Electrophoretic Techniques
- Electrophoretic Techniques : Principles and applications of the following electrophoresis techniques. Paper and gel electrophoresis, high voltage electrophoresis, SDS-PAGE : Discontinuous electrophoresis, isotachopheresis, isoelectric focussing and immunoelectrophoresis.
- Centrifugation Techniques :
- Various centrifugation techniques and their applications in Biochemistry. Preparative and analytical ultracentrifugation procedures. Application of partial specific volume, diffusion coefficient and viscosity measurements in the study of macromolecules of biochemical importance.

SECTION III

- Chromatographic Techniques
- Chromatographic Techniques : Introduction to Chromatography
- General principles of chromatography and the application of following chromatographic procedures in isolation and purification of biomolecules : Absorption, partition, paper and thin layer chromatography.
- Gas liquid chromatography. High performance liquid chromatography (HPLC), Ion exchange and Exclusion chromatography. Affinity chromatography

SECTION IV

- Radio Isotopic Techniques
- Radio Isotopic Techniques : Nature of isotopes and radioisotopes. Radioactive decay.
- Properties of radioactive emissions. Units of radioactivity. Techniques used to measure radioactivity; GM counter and liquid scintillation counting and gamma counter. Labelling of Biochemical compounds and autoradiography.
- Use of radioactive tracers in the study of enzyme reaction mechanisms and metabolic pathways. Radioimmuno assay.
- Biological hazards of radiation and safety measures in handling radioisotopes

PRACTICAL

Separation and identification of amino acids by

- (i) Paper chromatography (ii) Thin layer chromatography
- (ii) Separation of phospholipids by thin layer chromatography.

Preparation of starch from potato and its hydrolysis by salivary amylase

Estimation of lactic acid in blood before and after exercise.

Gel Electrophoresis of Nucleic Acids D. Rick Wood and B.D. Hames

Reference Books

- Principles and Techniques of Biochemistry and Molecular Biology by Keith Wilson
- Introduction to Instrumentation in Life Sciences by Prakash Singh Bisen, Anjana Sharma
- Chemical Analysis Modern Instrumentation Methods and Techniques Second Edition Francis Rouessac and Annick Rouessac
- Principles and Techniques of Biochemistry and Molecular Biology, 7th edition Wilson K.M., Walker J.M., Cambridge University Press, UK (2010),
- Biochemical spectroscopy. Vol 46 of Methods in Enzymology. (1995) Kenneth Sauer. Academic Press, USA
- Modern experimental biochemistry 3rd edition Publisher, USA. edition. (2000) Rodney Boyer. Prentice Hall
- Analytical Biochemistry, 3 edition, (1998), David Holmes, H. Peck, Prentice Hall, UK.
- An Introduction to Practical Biochemistry (3rd Edition) – David T Plummer. Tata McGraw-Hill Publishing Company Limited, 1992
- Introductory Practical Biochemistry by S. K. Sawhney, R. Singh

Objective:

- To gain elementary knowledge about Immunology
- To understand the basics of Humoral Immunity, Cell Mediated Immunity and Antigen-Antibody Interactions

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Immunity/Immune system, innate immunity, adaptive immunity, cells and organs involved in immune system
- Introduction and history of Immunology, Non-specific Defense; Physical Barriers, Chemical Barriers, Phagocytosis, Inflammation, Fever, Types of Immunity, Active & Passive Immunity, Immunological memory, Primary & Secondary Lymphoid organs, Mucosa Associated Lymphoid tissue (MALT), Cutaneous Associated Lymphoid Tissue (CALT), Lymphocyte Traffic, Cells of immune system, Antigens; factors affecting Immunogenicity, epitopes, haptens.
- Infection and immune system, Cancer Immunology

Section II

- Humoral Immunity
- Humoral Immune Response, Antibodies / Immunoglobulins, Structure, function and type of antibodies, Antigenic-combining regions of antibodies, factors influencing antibody production, Genetic model, Multigene Organisation, generation of antibody diversity.

Section III

- Cell Mediated Immunity
- Cell Mediated Immune System, Mechanism of CMI, Types of effector T Cells, Helper T-cells, Suppressor, T-cells, cytotoxic T cells, Killer T cells, Cytokines, Lymphokines, Colony Stimulating factors, Tumour Necrosis factor, Interferons, Accessory cells (Macrophages), the Complement System, Classical and Alternate pathway, HLA, Monoclonal antibody technology and its applications, Interactions between B and T lymphocytes.

Section IV

- Antigen-Antibody Interactions
- Antigen-Antibody Interactions : Precipitation reaction, Immuno-diffusion test, counter current Immuno electrophoresis, complement fixation tests, Widal test, Wasserman's test, Weil Felix reaction, Western Blotting, Types of vaccines.

Practical

Antigen-antibody interactions

- Agglutination
- Precipitation
- Blood grouping
- Immunodiffusion

REFERENCE BOOKS

- Immunology 5th ed Janis Kuby, W.H.Freeman & Co Ltd; 5th Revised edition.
- Fundamental Immunology 5th edition (August 2003): by William E., Md. Paul (Editor) By Lippincott Williams & Wilkins Publishers
- Essential Immunology, Ivan M. Roit (1994)– Blackwell Scientific Pub, Oxford.
- Cellular and Molecular Immunology, 3rd ed, Abbas, Saunders; 7 edition (11 June 2011)
- Practical immunology, Frank Hay, 4th Edition , Blackwell Science
- Medical Microbiology, Anantnarayan 3. Introduction to Practical Biochemistry, D.T. Plummer, Tata MacGraw Hill
- A Handbook of Practical Immunology – G P Talkwar
- Text Book of Medical Biochemistry, Praful Godkar. Bahalani Publishers.
- Immunology by Riott
- Immunology by Rao, C.V.
- Immunology by Roitt, Jonathaanrostoff and David Male
- Immunology and Serology by Joshi
- Molecular and antibody Probes in Diagnosis by Mathew R. Walker
- Molecular Biology in Medicine by Timothy M. Cox
- Molecular Biotechnology by Glick
- Current topics in AIDS (Volume I) by M.S. Gotlib

Objectives:

To provide basic knowledge of serology, serological techniques and serological tests.

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Introduction to serology
- Antigens, antibodies, structure and classes of antibodies, monoclonal antibodies and its uses.
- Collection and preparation of specimen, Epidemiological markers of microorganism serotyping,
- Principles of immunologic reactions, serodiagnosis.
- Collection and preparation of specimen, Serological test for syphilis (STS), Agglutination tests, C-reactive protein test (CRP), Rheumatoid arthritis test (RA), Serodiagnosis of streptococcal infection, Serodiagnostic tests for miscellaneous disorders, Immunologic test for pregnancy RIA, ELISA

SECTION II

- Epidemiological markers of microorganism serotyping,
- Serological Tests- Widal, ASO, LFT, CRP, Rosewall, brucella agglutination, cold agglutination, VDRL, TPHA, FTA-ABS
- Lab diagnosis of fungal infections Superficial dermatophyte fungal infections, Candidiasis, cryptococcosis, Pulmonary infections, Mycetoma, other deep mycotic infections, subcutaneous fungal infections subcutaneous fungal infections sporotrichosis, chromoblastomycosis, Eye and Ear fungi infections

SECTION III

- Serological tests for fungal infections and skin tests
- Advanced techniques in microbiology ELISA, RIA, CCIEA, Co-agglutination GLC, HPLC etc.
- Rapid diagnostic methods and Automation in Microbiology.
- Principles of Serological techniques used in virology- ELISA, RIA, IF, Immuno peroxidase test

SECTION IV

- Principles of serological techniques used in Virology-Part 1: HA, HAI, Had, SRH, RPHA, IHA, CFT, CIEP
- Principles of Serological techniques used in Virology-Part-11 Nt, ELISA, RIA, IF, Immuno-peroxidase test

PRACTICALS

1. Serological tests Serological test for syphilis (STS), Agglutination- 4 tests, C-reactive protein test (CRP), Rheumatoid arthritis test (RA), Serodiagnosis of streptococcal infection. HBsAg, HIV-1 (Rapid TriDot test) Widal test, Tuberculin test
2. SEROLOGICAL TESTS: Widal, ASO, LFT, CRP, Rosewall, Brucella agglutination, cold agglutination, VDRL, TPHA, FTA-ABS.
3. Principles of Serological techniques used in virology- ELISA, RIA, IF, Immuno peroxidase test \
4. Serological tests for fungal infections and skin tests
5. Advanced techniques in microbiology ELISA, RIA, CCIEA, Co-agglutination GLC, HPLC etc.
6. Rapid diagnostic methods and Automation in Microbiology.

Reference books

- Clinical Immunology and Serology: A Laboratory Perspective (Clinical Immunology and Serology (Stevens)) Paperback – Import, 1 Dec 2009 by Christine Dorresteyn Stevens
- Immunology & Serology in Laboratory Medicine, 5th Edition By Mary Louise Turgeon, EdD, MLS(ASCP)CM
- Kuby Immunology By Judy Owen, Jenni Punt, Sharon Stranford Publisher W.H. Freeman & Co Ltd

SEMESTER V
B.Voc. (Medical Lab Technology)

Skill BMLT 505 Paper - Clinical Biochemistry -I

Credits 6

Objectives: Clinical enzymology. Elementary knowledge of Hormones Elementary knowledge of Minerals and Electrolytes To Understand about Therapeutic Drug Monitoring

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole
- syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Clinical enzymology , Enzyme Histochemistry and demonstrations of phosphatases, dehydrogenases oxidases and peroxidases etc.

Section II

- Determination of serum glutamate pyruvate transaminase (SGPT) and serum glutamate Oxaloacetate transaminase (SGOT) End point reaction

Section III

- Estimation of important Amino acids and enzymes: Enzymes Acid Phosphatase (ACP), Alkaline Phosphatase (ALP), Transaminase, LDH, AST, ALT, Amylase and lactate dehydrogenase, Creatinine, Creatine Phosphokinase (CPK) , CPK-MB.

Section IV

- Liver tests, Renal tests, Endocrine function tests, Lipid profile

Practical

Liver tests, Renal tests, Endocrine function tests, Lipid profile,
Estimation of important Amino acids and enzymes: Enzymes Acid Phosphatase (ACP), Alkaline Phosphatase (ALP), Transaminase, LDH, AST, ALT, Amylase and lactate dehydrogenase, Creatinine, Creatine Phosphokinase (CPK) , CPK-MB.
Determination of serum glutamate pyruvate transaminase (SGPT) and serum glutamate Oxaloacetate transaminase (SGOT) End point reaction

Reference Books

- A guidebook to Biochemistry Michael Yudkin
- A Manual of Laboratory & Diagnostic Tests (6/ e) Frances Fischbach
- Biochemistry Voet and Voet
- Biochemistry Stryer
- Biochemistry U. Satyanarayan. & U. Chakrapani
- Clinical Biochemistry Richard Luxton
- Clinical Diagnosis & Management by Laboratory method0 (20/e) John Bernard Henary
- Clinical Biochemistry G. Guru
- Handbook of Biochemistry M.A. Siddique
- Textbook of Medical Biochemistry S. Ramkrishnan
- Biochemical Techniques K. Choudhary
- Text book of Medical Biochemistry Chaterjee & Shinde
- Principles of Biochemistry David L. Nelson
- Principles of Biochemistry Lehninger
- Textbook of Biochemistry and Human Biology G.P. Talwar
- Textbook of Medical Laboratory Technology Godkar and Godkar
- Outline of Biochemistry Conn Stumpf
- Principles of Internal Medicine Isselbacher
- Proteins and Proteomics : Laboratory Manual Richard J. Simpson
- Purifying Proteins for Proteomics: Laboratory Manual Richard J. Simpson
- Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001) Palmer Trevor, Publisher: Horwood Pub. Co., England.
- Outlines of Biochemistry: 5th Edition, Erice Conn & Paul Stumpf ; John Wiley and Sons, USA
- Fundamentals of Biochemistry. 3rd Edition (2008), Donald Voet & Judith Voet , John Wiley and Sons, Inc. USA
- Lehninger, Principles of Biochemistry. 5th Edition (2008), David Nelson & Michael Cox, W.H. Freeman and company, NY.
- Biochemistry: 7th Edition, (2012), Jeremy Berg, Lubert Stryer, W.H.Freeman and company, NY
- Biochemical Methods for Agricultural Sciences – Sadasivam and Manikam. Wiley Eastern Limited, 1992..
- Practical Clinical Biochemistry Harold Varley, CBS; 6 edition (1 December 2006)
- An Introduction to Practical Biochemistry (3rd Edition) – David T Plummer. Tata McGraw-Hill Publishing Company Limited, 1992.

SEMESTER VI

B.Voc. (Medical Lab Technology)

PAPER Skill BMLT 602 : Sensitization to Blood Banking and Infection Control

Credits 6

Objectives:

- **To understand blood transfusion reactions**
- **To understand the importance and methodology of cleanliness, and hygiene environment**
- **To understand the practices to curb infection**

Instructions:

- **The syllabus of this paper has been divided into four units.**
- **Examiner will set a total of nine questions comprising two questions from each unit,**
- **Question number one is compulsory of short answer type questions covering the whole**
- **syllabus.**
- **The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.**
- **All questions carry equal marks**

Section I

- **Components of blood**
- **Immuno- hematology in detail**
- **ABO blood group system in detail**
- **Rh blood group system in detail**

Section II

- **Methodology to identify blood groups**
- **Different aspects of Blood transfusion techniques**
- **Investigation of transfusion reaction.**
- **Transfusion of various components of blood**

Section III

- **Serum immunoglobulin**
- **Diifferent aspects of working in blood**
- **Storage of Blood**

Section IV

Infection control and prevention

- **Practices to curb infection**
 - **Hospital borne infections**
- **Prevention and treatment of needle stick injury**
 - **Management of blood and body substance spills in the health care setting**
- **The path of disease transmission:**
 - **paths of transmission including direct contact and penetrating injuries**
 - **risk of acquisition**
 - **sources of infecting microorganisms including persons who are carriers, in**
- **The incubation phase of the disease or those who are acutely ill**
- **Aspects of infectious diseases including:**
 - **opportunistic organisms, pathogens**

Reference Books

- Atlas of haematology (5/e) G.A. McDonald
- Clinical Haematology Christopher A. Ludlam
- Practical Haematology J.B. Dacie
- Practical Haematology (8/e) Sir John
- Haematology (International edition) Emmanuel C.Besa
- Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M. Robinson
- Haematology for students Practitioners Ramnik Sood
- Hand book of Medical Laboratory Technology (2/e) V.H. Talib
- Handbook of Blood Banking and Transfusion Medicine by Rao Gundu HR, Jagannathan Latha, Eastlund Ted
- Modern Blood Banking & Transfusion Practices Hardcover – 2012 by Denise M Harmening
- Textbook of Blood Banking and Transfusion Medicine - Elsevier eBook on VitalSource, 2nd Edition
By Sally V. Rudmann, PhD, MT(ASCP)SBB, CLS
- Textbook of Blood Banking and Transfusion Medicine by Sally V. Rudmann
- Hospital Epidemiology and Infection Control by C. Glen Mayhall
- Hospital Acquired Infections: Prevention and Control Paperback – Import, 2010 by Purva Mathur
- Hospital Infection Control Guidelines: Principles and Practice by Singh Sanjeev, Gupta Shakti Kumar, Kant Sunil
- Bennett & Brachman's Hospital Infections Sixth Edition by William R. Jarvis MD (Author)
- Handbook of Hospital Infection Control, 2013 by Sanjay Singhal
- Hospital Infection Prevention Principles & Practices Editors: Wattal, Chand, Khardori, Nancy

SEMESTER VI
B.Voc. (Medical Lab Technology)

PAPER Skill BMLT 603 : Microbiology -II

Credits 6

Objectives:

- To learn the techniques of collection of samples, their processing and the identifications of the various pathogens, like bacteria, parasites, viruses, using different techniques.
- To provide vigorous training in the use of standard safety measures while handling highly infected material.
- To provide basic knowledge of the different diseases caused by various microorganisms is also imparted.

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

Section I

- Preservation of microbes and Lyophilisation methods.
- Total and viable counts of bacteria.
- Testing of disinfectants-Rideal-Walker, Chick-Martin and In-use tests.
- Preparation and standardization of vaccines and immunization schedule.
- Bacteriological examination of water, milk, food and air.
- Nosocomial infections and sterility testing of I/V fluids and processing of various samples for hospital infections.
- Toxin-Antitoxin assays and pathogenicity tests.
- Epidemiological markers of microorganisms-Serotyping, Bacteriophage and Bacteriocine typing methods.

Section II

- Lab, Diagnosis of common bacterial infection viz: Pyogenic infections, Respiratory tract infections, Meningitis, Diphtheria, whooping cough, Gas gangrene, Food-poisoning, Enteric fever, Acute diarrhoea diseases, Cholera Urinary tract infection, Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, Syphilis, Gonorrhoea and other STD's.
- SEROLOGICAL TESTS: Widal, ASO, LFT, CRP, Rosewaller, Brucella agglutination, cold agglutination, VDRL, TPHA, FTA-Abs.
- Lab diagnosis of fungal infections viz: Superficial Dermatophyte fungal infections
- Candidiasis, Cryptococcosis, pulmonary infections, Mycetoma, other deep mycotic infections, subcutaneous fungal infections-Sporotrichosis, Chromoblastomycosis,
- Eye and Ear fungi infections.
- Serological tests for fungal infections and skin tests.
- Advanced techniques in microbiology-ELISA, RIA, CCIEP, Co-agglutination GLC, HPLC etc.
- Rapid diagnostic methods and Automation. in Microbiology.

Section III

- Handling of fresh histological specimen(tissues) cryo/frozen sections of fresh and fixed tissues, freeze drying.
- Lipids, identification and demonstration
- Micro-organisms in tissues- various staining technique for their demonstration
- Identification of Nucleic acids, DNA and RNA special stains and procedures
- Cytoplasmic constituents and their demonstration
- Cervical cytology-basis of detection of malignant and premalignant lesions
- Hermonal assessment with cytologic techniques and sex chromatin and pregnancy tests.
- Allergy
- Rheumatological diseases and investigations.

Section IV

- Advanced techniques and future trends in field of microbiology
- Updated on advanced techniques and future trends in field of diagnostic microbiology
- Updated on advanced techniques and future trends in field of molecular diagnostic technique
- Updated on advanced techniques and future trends in field of tele-pathology

Practicals

- Preservation of microbes and lyophilisation methods.
- Total and viable counts of bacteria.
- Testing of disinfectants-Rideal-Walker, Chick-Martin and In-use tests.
- Preparation and standardization of vaccines and immunization schedule
- Lab, Diagnosis of common bacterial infection viz: Pyogenic infections, Respiratory tract infections, Meningitis, Diphtheria, whooping cough, Gas gangrene, Food-poisoning, Enteric fever, Acute diarrhoea diseases, Cholera Urinary tract infection, Tuberculosis, Leprosy, Plague, Anthrax, Typhus fever, Syphilis, Gonorrhoea and other STD's.
- SEROLOGICAL TESTS: Widal, ASO, LFT, CRP, Rosewaller, Brucella agglutination, cold agglutination, VDRL, TPHA, FTA-Abs.
- Lab diagnosis of fungal infections viz: Superficial Dermatophyte fungal infections
- Candidiasis, Cryptococcosis, pulmonary infections, Mycetoma, other deep mycotic infections, subcutaneous fungal infections-Sporotrichosis, Chromoblastomycosis,
- Eye and Ear fungi infections.
- Serological tests for fungal infections and skin tests.
- Advanced techniques in microbiology-ELISA, RIA, CCIEP, Co-agglutination GLC, HPLC etc.
- Rapid diagnostic methods and Automation. in Microbiology.

Reference Books

- Mims' Medical Microbiology Richard Goering , Hazel Dockrell , Mark Zuckerman , Ivan M. Roitt , Professor Peter L. Chiodini Publisher Elsevier Health Sciences
- Ananthanarayanan and Paniker's Text book of Microbiology edited by CKJ Paniker 7th edition, Publisher Orient Longman
- Roitt's Essential immunology Delves, Peter J., Martin, Seamus J. Burton, Dennis R. Roitt, Ivan M Ananthanarayanan and Paniker's Textbook of microbiology Kapil , arti ed
- Microbiology: an Introduction, 12th edition Gerard J. Tortora Berdell R. Funke and Christine L. Case
- Parasitology Chatterjee K.D.
- Microbiology Pelczar, Michal J and Others
- Medical microbiology Greenwood David and Other
- Ananthanarayanan and Paniker's text book of Microbiology Arti kapil
- Immunology Male David and Other
- Mackie and Mc Cartney practical Medical Microbiology Collee J.G and Other
- Bailey and Scott's Diagnostic Microbiology, 13th edition Patricia Tille
- Sherris Medical Microbiology , 6th edition Pottinger, L. Barth Reller and Charles R. Sterling
- Stephenson Calculations for Molecular Biology
- Gerald Karp Cell Molecular Biology
- Stanier General Microbiology

Objectives:

To understand various tests of Clinical Biochemistry and advanced techniques and future trends in field of biochemistry .

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Glucose tolerance test, insulin tolerance test, gastric analysis, Xylose absorption test
- Clearance test for renal function
- Analysis of calculi and CSF
- Automation in clinical biochemistry laboratory

SECTION II

- Mechanism and testing in detail
- Bone marrow in detail
- Detailed Examination of Stool
- Detailed Examination of Semen
- Detailed Examination of Sputum
- Detailed Examination of CSF, and other body fluids like pleural fluid, pericardial,peritoneal,synovial,ascitic fluid.

SECTION III

- Advanced techniques and future trends in field of biochemistry
- Advanced techniques and future trends in field of clinical pathology

SECTION IV

- Describe archiving protocol emphasizing on storage and retrieval of samples,
- specimens data and records,
- Describe source of error/ interference/ quality of work and initiate corrective action as applicable
- Describe assessment of results to initiate follow-up testing, Understanding of chemicals/reagents useful in sample analysis
- Understanding of maintaining record of inventory , test results, etc.
- Inspect the availability of medical supplies or diagnostic kits
- Differentiation between clinically significant and insignificant findings ,
- Able to establish and monitor quality assurance programs or activities to ensure the accuracy of insignificant findings ,
- Quality control of clinical investigations, Able to establish and monitor quality assurance programs or activities to ensure the accuracy of laboratory results

Practicals

Glucose tolerance test
insulin tolerance test
gastric analysis
Xylose absorption test
Clearance test for renal function
Analysis of calculi and CSF
Automation in clinical biochemistry laboratory
Detailed Examination of Stool
Detailed Examination of Semen
Detailed Examination of Sputum
Detailed demonstrations of examinations of bone marrow, CSF, and other body fluids like pleural fluid, pericardial,peritoneal,synovial,ascitic fluid.

Reference Books

- **A guidebook to Biochemistry Michael Yudkin**
- **A Manual of Laboratory & Diagnostic Tests (6/ e) Frances Fischbach**
- **Biochemistry Voet and Voet**
- **Biochemistry Stryer**
- **Biochemistry U. Satyanarayan. & U. Chakrapani**
- **Clinical Biochemistry Richard Luxton**
- **Clinical Diagnosis & Management by Laboratory method0 (20/e) John Bernard Henary**
- **Clinical Biochemistry G. Guru**
- **Handbook of Biochemistry M.A. Siddique**
- **Textbook of Medical Biochemistry S. Ramkrishnan**
- **Biochemical Techniques K. Choudhary**
- **Text book of Medical Biochemistry Chaterjee & Shinde**
- **Principles of Biochemistry David L. Nelson**
- **Principles of Biochemistry Lehninger**
- **Textbook of Biochemistry and Human Biology G.P. Talwar**
- **Textbook of Medical Laboratory Technology Godkar and Godkar**
- **Outline of Biochemistry Conn Stumpf**
- **Principles of Internal Medicine Isselbacher**
- **Proteins and Proteomics : Laboratory Manual Richard J. Simpson**
- **Purifying Proteins for Proteomics: Laboratory Manual Richard J. Simpson**

Objectives:

- To enable the students to perform various tests for haematological disorders
- To study the techniques for cytogenetics techniques
- To understand the use of radioisotopes in Haematology

Instructions:

- The syllabus of this paper has been divided into four units.
- Examiner will set a total of nine questions comprising two questions from each unit,
- Question number one is compulsory of short answer type questions covering the whole syllabus.
- The students are required to attempt one question from each unit and the entire Compulsory Question No. 1.
- All questions carry equal marks

SECTION I

- Laboratory tests for assessing bleeding disorders
- Laboratory investigation for disseminated intravascular coagulation(DIC)

SECTION II

- Mechanism of fibrinolysis test for fibrinolysis
- Platelet function tests and their interpretation

SECTION III

- Techniques available for cytogenetic studies
- Use of Radioisotopes in hematology
- Safety measures for handling Radioisotopes

SECTION IV

- Advanced techniques and future trends in field of haematology & blood banking
- Advanced techniques and future trends in field of clinical pathology
- Advanced techniques and future trends in field of histopathology & cytopathology

Practicals

1. Tests for assessing bleeding disorders
2. Laboratory investigation for disseminated intravascular coagulation(DIC)
3. Mechanism of fibrinolysis test for fibrinolysis
4. Platelet function tests and their interpretation

Reference Books

- Clinical Haematology Christopher A. Ludlam
- Practical Haematology J.B. Dacie
- Practical Haematology (8/e) Sir John
- Haematology (International edition) Emmanuel C. Besa
- Haematology (Pathophysiological basis for clinical practice (3/e) Stephen M. Robinson
- Haematology for students Practitioners Ramnik Sood
- Hand book of Medical Laboratory Technology (2/e) V.H. Talib
- Atlas of haematology (5/e) G.A. McDonald