



**Department of Paramedical Sciences**

**Faculty of Allied Health Sciences**

**SGT UNIVERSITY**

Shree Guru Gobind Singh Tricentenary University

**Gurgaon-122505**

**Syllabus**

**B.Sc. Medical Laboratory Technology (MLT)**

**Duration: 3 years (6 Semester)**

**W.e.f. Academic Session 2020-21**

  
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## **HUMAN ANATOMY-I**

**PAPER CODE-05270101**

**B. Sc. Semester I (Medical Laboratory Technology)**

**L T P Credits**  
**3 - 3**

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**  
**Duration of Examination: 3 Hours**

### **UNIT-I**

**Introduction: human body as a whole**

Definition of anatomy and its subdivisions

Anatomical nomenclature and terminology (planes & positions)

Surface Anatomy of main structures and vessels

#### **Applied anatomy & Joints**

**Musculoskeletal system**

**Connective tissue & its modification, tendons, membranes, special connective tissue.**

**Bone structure, blood supply, growth, ossification, and classification.**

**Muscle classification, structure and functional aspect.**

**Joints classification, structures of joints, movements, range, limiting factors, stability, blood supply**

**Nerve supply, dislocations and applied anatomy**

### **UNIT-II**

#### **Extremity (Lower & Upper extremities)**

**Bony architecture**

**Joints – structure, range of movement**

**Muscles – origin, insertion, actions, nerve supply**

**Major nerves – course, branches and implications of nerve injuries Development of limb bones, muscles and anomalies**

**Radiographic identification of bone and joints Applied anatomy**

#### **Lower extremity**

**Bony architecture**

**Joints – structure, range of movement**

**Muscles – origin, insertion, actions, nerve supply**

**Major nerves – course, branches and implications of nerve injuries Development of limb bones, muscles and anomalies**

**Radiographic identification of bone and joints Applied anatomy**

### **UNIT-III**

#### **Spine and thorax**

**Back muscles -Superficial layer**

**Deep muscles of back, their origin, insertion, action and nerve supply.**



Vertebral column – Structure & Development, Structure & Joints of vertebra. Thoracic cage

**Head and neck: Cranium**

Facial Muscles – origin, insertion, actions, nerve supply Temporal mandibular Joints – structure, types of movement

#### UNIT-IV

**Cardiovascular system (with relevant applied anatomy)**

Heart-Size, location, chambers.

Circulation -Systemic & pulmonary

Great vessels of the heart, branches of aorta.

Overview of blood vessels of upper extremity and lower extremity

**Lymphatic system- (with relevant applied anatomy)**

Salient features of lymphatic organs (spleen, tonsil, thymus, lymph node)

#### UNIT-V

**Gastro-intestinal system (with relevant applied anatomy)**

Part of the gastrointestinal tract

Gross anatomy of Tongue, stomach, small and large intestine, liver, gall bladder Pancreas and other digestive organ & related applied anatomy

**Respiratory system (with relevant applied anatomy)**

Part of respiratory system with salient gross features of lung

Brief description of intercostal muscles and Para-nasal air sinuses

### HUMAN ANATOMY I-PRACTICAL

PAPER CODE-05270102

B. Sc. Semester I (MLT)

L T P Credits  
- - 1/2

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

- 1) Identification and description of all anatomical structures.
- 2) Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).
- 3) Demonstration of skeleton-articulated and disarticulated.
- 4) Surface anatomy: Surface land mark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.



## HUMAN PHYSIOLOGY-I

PAPER CODE-05270103

B. Sc. Semester I (Medical Laboratory Technology)

L T P Credits  
3 - 3

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks

Duration of Examination: 3 Hours

### UNIT-I

#### General Physiology

Cell: morphology, Structure and function of cell organelles Structure of cell membrane

Transport across cell membrane Intercellular communication Homeostasis

#### Blood

Introduction-composition & function of blood

W.B.C., R.B.C., Platelets formation & functions, Immunity

Plasma: composition, formation & functions, Plasma Proteins: -types & functions, Blood Groups-  
types, significance, determination.

Hemoglobin, Haemostasis

Lymph-composition, formation, circulation & functions

### UNIT-II

#### Cardiovascular system

Conducting system-components, impulse conduction Heart valves Cardiac cycle-definition, phases of  
cardiac cycle.

Cardiac output-definition, normal value, determinants.

Stroke volume and its regulation.

Heart rate and its regulation.

Arterial pulse, Blood pressure-definition, normal values, factors affecting blood pressure.

Shock-definition, classification, causes and features, Basic idea of ECG, Cardiovascular changes  
during exercise

### UNIT-III

#### Respiratory System

Mechanics of respiration Lung volumes and capacities

Pulmonary circulation, transport of respiratory gases

Factors affecting respiration, Regulation of respiration-neural regulation, voluntary control and  
chemical regulation

Hypoxia, Hypercapnoea, Hypocapnoea,

Artificial respiration Disorders of respiration- dyspnoea, orthopnoea, hyperpnoea, hyperventilation,  
apnoea, Tachypnoea, Respiratory changes during exercise.

Digestive System Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation

Functions of Liver & Stomach



## UNIT-IV

### Nervous system

Introduction, central and peripheral nervous system, functions of nervous system

Reflexes-monosynaptic, polysynaptic, superficial, deep & withdrawal reflex Sense organ, receptors, electrical & chemical events in receptors.

Sensory pathways for touch, temperature, pain, proprioception & others.

Control of tone & posture: Integration at spinal, brain stem, cerebellar, basal ganglion levels, along with their functions.

Motor mechanism: motor cortex, motor pathway: the descending tracts -pyramidal & extrapyramidal tracts-origin, course, termination & functions. Upper motor neuron and lower motor neuron paralysis.

Special senses-eye, ear, nose, mouth

Water excretion, concentration of urine-regulation of Na<sup>+</sup>, Cl<sup>-</sup>, K<sup>+</sup> excretion

### Nerve Muscle Physiology

Muscles-classification, structure, properties, Excitation, contraction, coupling, Motor unit, EMG, factors affecting muscle tension, Muscle tone, fatigue, exercise.

Nerve – structure and function of neurons, classification, properties Resting membrane potential & Action potential their ionic basis, All or None phenomenon Neuromuscular transmission Ionic basis of nerve conduction.

Concept of nerve injury & Wallerian degeneration Synapses.

Electrical events in postsynaptic neurons Inhibition & facilitation at synapses.

Chemical transmission of synaptic activity Principal neurotransmitters. Chemical transmission of synaptic activity Principal neurotransmitters.

## HUMAN PHYSIOLOGY I-PRACTICAL

PAPER CODE-05270104

B. Sc. Semester I (MLT)

L T P Credits  
- - 1/2

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

1. Haemoglobinometry
2. WhiteBloodCellcount
3. RedBloodCellcount
4. DeterminationofBloodGroups
5. Leishman'sstainingandDifferentialWBCcount
6. DeterminationofpackedcellVolume
7. Erythrocytesedimentationrate[ESR]
8. CalculationofBloodindices
9. DeterminationofClottingTime,BleedingTime



## **BASIC BIOCHEMISTRY**

PAPER CODE-05270105

B. Sc. Semester I (Medical Laboratory Technology)

L T P Credits  
3 - 3

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks

Duration of Examination: 3 Hours

### **Basic concept of metabolism and their applied aspects**

#### **Unit-I**

**Carbohydrates:** Definition, function and classification of carbohydrate. Monosaccharide, glycoside formation, oligosaccharides and polysaccharides. Glycolysis, catabolic fates of pyruvate, metabolic fate of Acetyl-CoA and Citric acid cycle, gluconeogenesis, glycogen metabolism, pentose phosphate pathway.

#### **Unit-II**

**Amino acids and proteins:** Definition, structure, classification, essential & non essential amino acids. Proteins definition and classification. Primary, secondary, tertiary and quaternary of proteins of proteins

#### **Unit-III**

**Vitamins:** Definition and classification of vitamins, difference between fat soluble and water soluble vitamins. Water soluble vitamins and fat soluble vitamins

#### **Unit-IV**

**Lipids:** Definition, classification and function of lipids. Fatty Acids, Triacylglycerols or Triacylgcerides or neutral fat. Fatty acid metabolism. Ketone body metabolism.

## **BASIC BIOCHEMISTRY-PRACTICAL**

PAPER CODE-05270106

B. Sc. Semester I (MLT)

L T P Credits  
- - 1/2

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

1. Identification of carbohydrates by Molisch's test.
2. Identification of reducing sugar by Benedict's test.
3. Identification of ketose sugars by Seliwanoff's test.
4. Identification of reducing sugar by Osazone test.
5. Identification of cholesterol by Salkowski's test.
6. Identification of protein by Biuret's test.
7. Identification of protein by Ninhydrin test.

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## **GENERAL MICROBIOLOGY**

**PAPER CODE-05270107**

**B. Sc. Semester I (Medical Laboratory Technology)**

**L T P Credits**  
**3 - 3**

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**

**Duration of Examination: 3 Hours**

### **UNIT-I**

**Safety measures in laboratory**

**Microscopy: Principle, working and applications of Light microscope, Dark field, Phase contrast microscopy, Fluorescent & Electron microscopy**

**Sterilization and Disinfection: Physical Methods of Sterilization, Chemical Methods of Sterilization, Methods of Disinfection**

### **UNIT-II**

**Introduction and classification of Bacteria, Morphology of bacteria, Growth, Nutrition & Metabolism of Bacteria**

**Normal microbial flora of human body, role of normal flora, probiotics.**

**Bacterial genetics- Bacterial DNA & RNA, Replication of bacteria.**

**Microbial pathogenicity**

### **UNIT-III**

**Bacterial Culture and Identification: Culture Media & Transport Media, Aerobic Bacterial Culture Techniques, Anaerobic Bacterial Culture Techniques, Sample collection and transport methods**

**Bacterial identification techniques: Conventional methods, Automated culture techniques.**

### **UNIT-IV**

**Smear preparation & Staining methods: Gram stain, Acid fast stain, Negative stain, Spore stain**

**Antimicrobial susceptibility testing: Principle and techniques of Diffusion Methods**

**Dilution Methods**

**Preservation techniques of bacteria**

  
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**GENERAL MICROBIOLOGY-PRACTICAL**

**PAPER CODE-05270108**

**B. Sc. Semester I (MLT)**

**L T P Credits**  
- - 1/2

**Examination: 30 Marks**  
**Int. Assessment: 20 Marks**  
**Total: 50 Marks**

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1. Microscope  
Light Microscope
2. Staining  
Grams staining  
ZN staining  
Negative stain
3. Preparation of commonly used culture media  
Nutrient Agar  
Blood Agar  
Chocolate agar  
Mac Conkey agar  
Muller Hinton agar
4. Culture methods  
Streak method  
Lawn method  
Stroke method  
Stab method  
Pour Plate method  
Liquid method
5. Antibiotic susceptibility test  
Diffusion methods  
Dilution Methods

  
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## **BASIC PATHOLOGY AND HAEMATOLOGY**

**PAPER CODE-05270109**

**B. Sc. Semester I (Medical Laboratory Technology)**

L	T	P	Credits
3	-	3	

Examination:	60 Marks
Int. Assessment:	40 Marks
Total:	100 Marks

**Duration of Examination: 3 Hours**

### **UNIT-I**

Pathology & its branches  
Normal cell and its functions  
Various types of microscope & light microscope in details.

### **UNIT-II**

Introduction to hematology and laboratory Organization.  
Formation of Blood  
Composition and functions of blood  
Various anticoagulants, their uses, mode of action and their merits & demerits.  
Collection & preservation of blood for various hematological investigations.

### **UNIT-III**

Normal hematological indices (MCV, MCH, MCHC, PCV)  
Normal and absolute values in hematology.  
Quality assurance in hematology.  
Various methods of estimation of Hb involved and standardization of instrument.

### **UNIT-IV**

Haemocytometry:- Procedure of cell count, visual as well as electronic red cell, Leucytes and platelet count.  
Romanowsky dyes, preparation and staining procedure of blood smears.  
Morphology of normal blood cells and their identification.  
ESR & Factors influencing ESR and various procedures for its estimation.

## **BASIC PATHOLOGY AND HAEMATOLOGY-PRACTICAL**

**PAPER CODE-05270110**

**B. Sc. Semester I (MLT)**

L	T	P	Credits
-	-	1/2	

Examination:	30 Marks
Int. Assessment:	20 Marks
Total:	50 Marks

Hemoglobin estimation – Sahli's method  
Peripheral blood film (PFB), Preparation, staining by leishman stain & examination.  
Cell counts by Neubauer chamber – RBCs, WBC, Platelets.  
ESR & PCV estimation



## COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

PAPER CODE-05270111

B. Sc. Semester I (Medical Laboratory Technology)

L	T	P	Credits
3	1	-	4

Examination:	60 Marks
Int. Assessment:	40 Marks
Total:	100 Marks

Duration of Examination: 3 Hours

### Unit I

#### Listening Comprehension

- Speeches
- Interviews
- audio-video clippings followed by exercises
- Introduction to Communication
- Importance of Communication
- Barriers to Communication and ways to overcome them

### Unit II

#### Conversation Skills

- Greetings and introducing oneself
- Framing questions and answer
- Role play
- Buying: asking details etc
- Word formation strategies
- Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One word substitution

### Unit III

#### Reading Comprehension

- Simple narration and Stories
- Simple Passages
- Newspaper and articles clippings
- Note Making
- Paragraph Writing
- Comprehension
- Report Writing: types, characteristics
- Introduction to Letter Writing

### Unit IV:

#### Pronunciation

- Pronunciation
- Syllable and Stress
- Intonation and Modulation

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## **UNIT V**

### **Writing Comprehension**

- Letters: types, format, style
- Précis Writing
- Paragraph: Order, Topic sentence, consistency, coherence
- Report and Proposal

Project Writing: Features, Structure

  
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## HUMAN ANATOMY-II

PAPER CODE-05270201

B. Sc. Semester II (Medical Laboratory Technology)

L T P Credits  
3 - 3

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### UNIT-I

#### **Urinary system (with relevant applied anatomy)**

Parts of urinary system

Salient gross features of kidney, urinary bladder, ureter and urethra.

### UNIT-II

#### **Reproductive system**

Parts of male and female reproductive system with salient gross features of testis & uterus, ovary and fallopian tube

### UNIT-III

#### **Endocrine glands**

List of the endocrine glands, their position and salient gross features

Hormones produced by each endocrine glands

#### **Embryology**

Spermatogenesis & oogenesis

Ovulation, fertilization, Placenta, Fetal circulation

### UNIT-IV

#### **Nervous system**

Classification of the nervous system, Definitions of central, peripheral and autonomic nervous system

Neuron- structure and classification, neuroglia

Names of lobes of Cerebrum and cerebellum, Parts of brainstem (salient features only)

.Cerebrospinal fluid and its circulation, names of cranial nerves, spinal nerve, meninges, ventricles ( salient features only)

### UNIT-V

#### **Sensory organs**

Skin: Its appendages and functions

Eye: Parts of eye and its structure

Ear: Parts of ear- external, middle and inner ear and contents.

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## HUMAN ANATOMY I-PRACTICAL

PAPER CODE-05270202

B. Sc. Semester II (MLT)

L T P Credits  
- - 1/2

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

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Identification and description of all anatomical structures.

Demonstration of dissected parts

Demonstration of skeleton-articulated and disarticulated.

Surface anatomy: Surface land mark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

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## **HUMAN PHYSIOLOGY-II**

PAPER CODE-05270203

B. Sc. Semester II (Medical Laboratory Technology)

L T P Credits  
3 - 3

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### **UNIT-I**

#### **Excretory system:**

Functions of kidneys,  
Composition of urine  
Mechanism of urine formation  
Regulations of body temperature  
Fluid and electrolyte balance  
Alterations in disease

### **UNIT-II**

#### **Sensory Organs:**

Functions of skin, eye, ear, nose, tongue  
Alterations in disease

### **UNIT-III**

#### **Endocrines**

Functions of pituitary, Pineal gland, Thymus, Thyroid, Parathyroid,  
Pancreas,  
Suprarenal & placenta  
Alterations in disease

### **UNIT-IV**

#### **Reproduction**

Reproduction of cells-DNA, Mitosis, Meiosis, Spermatogenesis, Oogenesis  
Functions of female reproductive organs:  
Functions of breast, female sexual cycle  
Introduction to embryology  
Functions of male reproductive organs:  
Fertility system  
Alterations in disease

### **UNIT-V**

#### **Lymphatic and Immunological system:**

Circulation of lymph  
Immunity  
Formations of T- Cells and B- Cells

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Types of Immune response

Antigens

Cytokines

**HUMAN PHYSIOLOGY II-PRACTICAL**

**PAPER CODE-05270204**

**B. Sc. Semester II (MLT)**

**L T P Credits**

- - 1/2

**Examination:**

**30 Marks**

**Int. Assessment:**

**20 Marks**

**Total:**

**50 Marks**

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1. Haemoglobinometry
  2. White Blood Cell count
  3. Red Blood Cell count
  4. Determination of Blood Groups
  5. Leishman's staining and Differential WBC count
  6. Determination of packed cell Volume
  7. Erythrocyte sedimentation rate[ESR]
  8. Calculation of Blood indices
  9. Determination of Clotting Time, Bleeding Time
  10. Blood pressure recording
  11. Auscultation for Heart Sounds
  12. Artificial Respiration

  
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## **LABORATORY APPARATUS, REAGENTS AND CONCEPTS OF SI UNITS**

PAPER CODE-05270205

B. Sc. Semester II (Medical Laboratory Technology)

L T P Credits  
3 - 3

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### **INTRODUCTION TO LABORATORY APPARATUS:**

#### **Unit-I**

**Overview of the functioning of Biochemistry clinical laboratory.**

Introduction to glass wares:

Test tubes and serum tubes.

Test tube draining rack, bottle racks, Pipette stands, tripod stand, wire gauze and Bunsen burner.

Cuvettes and their application in colorimetry and spectrophotometry.

Bottle Dispensers and their Maintenance.

Maintenance, Care and cleaning of laboratory glassware.

#### **Unit-II**

**Introduction to the laboratory instruments and their maintenance:**

Use care and maintenance.

Water Distillation Plant and Deionizers

Refrigerators

Centrifuges

Laboratory Balance and Direct Readout Electrical Balances

Colorimeter

Spectrophotometer

pH Meter and its Calibration

#### **Unit-III**

### **CONVENTIONAL AND SI UNITS USED IN THE LABORATORY**

Molecular and equivalent weight

Normality, molality, molarity

Concentrations of solutions by w/w, w/v, v/v etc.

Preparation of standard solutions

Molar solutions and Percent solutions

Acid, base, salts and buffers

Indicators and their Functions

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Buffers of the body

#### Unit-IV

#### **DILUTIONS of solutions or samples:**

Preparation of a stock standard and working standard.

Proper method of dilution of a solution or a laboratory sample.

Serial dilutions of samples

Saturated and supersaturated solutions

Significance of volumetric flask in preparing standard solutions,

#### **LABORATORY APPARATUS, REAGENTS AND CONCEPTS OF SI UNITS**

#### **-PRACTICAL**

**PAPER CODE-05270206**

**B. Sc. Semester II (MLT)**

**L T P Credits**  
- - 1/2

**Examination: 30 Marks**  
**Int. Assessment: 20 Marks**  
**Total: 50 Marks**

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Introduction to glassware and instruments

Preparation of %, molar and normal solutions

Understanding the principle of pH meter and Demonstration of pH meter

Colorimetry

Principle of colorimetry (Lambert and Beer's laws and their verification), colorimeter and its uses

Standard curve, features and uses

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## **BASIC CONCEPTS OF IMMUNOLOGY AND SYSTEMIC BACTERIOLOGY**

PAPER CODE-05270207

B. Sc. Semester II (Medical Laboratory Technology)

L T P Credits  
3 - 3

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### **UNIT-I**

Concept of Immunity and its types. Antigen & Antibody

Antigen antibody reactions I: Principle and types of Precipitation reaction and Agglutination reactions

Antigen antibody reactions II: Complement fixation, Neutralization, ELISA, RIA, IF

### **UNIT-II**

Systemic Bacteriology I: Morphology, culture characteristic, identification, diseases caused and laboratory diagnosis of-Staphylococcus, Streptococcus, Bacillus, Neisseria, Corynebacterium, Clostridium, Mycobacteria

### **UNIT-III**

Systemic Bacteriology I: Morphology, culture characteristic, identification, diseases caused and laboratory diagnosis of- Shigella, Salmonella, E.coli, Klebsiella, Proteus, Vibrio, Pseudomonas, Spirochetes

### **UNIT IV**

Morphology, culture characteristic, identification, diseases caused and laboratory diagnosis of Mycoplasma, Nocardia, Actinomycetes, Legionella, Rickettsia

Immunoprophylaxis: Vaccines and its types.

National immunization schedule (NIS) for infants, children, pregnant women and healthcare workers.

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## BASIC CONCEPTS OF IMMUNOLOGY AND SYSTEMIC BACTERIOLOGY

### -PRACTICAL

PAPER CODE-05270208

B. Sc. Semester II (MLT)

L T P Credits  
- - 1/2

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

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Identification of bacterial culture  
Colony characteristics  
Morphological characteristics

Bio medical waste  
Use of colour coded bags  
Black  
Blue  
Red  
Yellow  
Demonstration of Sterilization & Disinfection method  
Autoclave  
Hot Air oven  
Water bath  
Inspissator  
Chemical Sterilization  
Collection of specimen  
From outpatient units  
Inpatient units  
Minor operation theatre  
Major operation theatre for sterility testing  
Disinfection of wards, OT and Laboratory  
Visit to CSSD  
Demonstration of personal protective equipment  
Sterility testing Methods

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## SYSTEMIC AND CLINICAL PATHOLOGY

PAPER CODE-05270209

B. Sc. Semester II (Medical Laboratory Technology)

L T P Credits  
3 - 3

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### UNIT-I

#### Clinical Pathology

**Routine urine examination**—specimen, physical examination, chemical examination, microscopic examination, **routine examination of CSF**, semen analysis, routine examination of sputum, routine examination of body fluids- pleural, peritoneal, synovial.

### UNIT-II

#### Haemodynamic Disorders-

Oedema, thrombosis, Embolism, Infarction, Shock, Hyperemia & congestion, Hemorrhage.

**Neoplasm-** Definition, Classification, nomenclature and characteristics, Aetiology & agents causing neoplasm, Biology of neoplastic growth & neoplasm immunology.

### UNIT-III

**Cardiovascular System-** Myocardial Infarction, Atherosclerosis, Pericardial Heart Disease, Ischemic Heart Disease, response of Vascular Walls to injury, Venous Diseases. **Respiratory system-** Restrictive lung disease, pulmonary infection, pleural disorders-pneumothorax, pleural effusion, carcinomas.

**Digestive System-** Disease of Oesophagus – Congenital, Muscular, Inflammatory and Tumors, Salivary tumors, Stomach - Peptic Ulcer, Gastritis, Neoplasm of Stomach, Intestine – Inflammatory - Ulcerative Colitis, Crohn's Disease, Infective – Enterocolitis, Colorectal cancer, Acute and Chronic Hepatitis, Cirrhosis of Liver, Hydronephrosis, Renal cell carcinoma– Carcinoma of the Breast, Vaginitis, Endometrial Hyperplasia, Ovarian Tumors, Testicular Tumors.

### Unit VI:

**Nervous system-** Meningitis, Encephalitis, Cerebrovascular disease, Demyelinating Disease, Alzheimer's disease, Muscular Dystrophy, Disorder of Neuromuscular Junction. **Skeletal System-** Pyogenic Osteomyelitis, Tubercular Osteomyelitis, Tumors, Osteoporosis, Rickets, Osteoarthritis, Musculoskeletal system.

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## SYSTEMIC AND CLINICAL PATHOLOGY

### -PRACTICAL

PAPER CODE-05270210

B. Sc. Semester II (MLT)

L T P Credits  
- - 1/2

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

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1. BT & CT determination
2. ABO/Rh blood grouping by slide methods- Forward & reverse grouping
3. Urine examination – complete (Physical & chemical examination for glucose, proteins, bile salts & ketone bodies).
4. Semen analysis – Physical, Chemical & Neubauer's chamber counting.

  
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## FUNDAMENTALS OF COMPUTER SCIENCE

PAPER CODE-05270211

B. Sc. Semester II (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

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### UNIT-I

#### **Introduction:**

What are computers, Application areas, Characteristics & limitations, Evolution of computers, Classification & generations of computers, Data representation in computer memory (numbering system)

#### **Computers Architecture /Organization:**

Basic architecture, Functional Block diagram, Types of computers on the basis of purpose, Signal and Portability.

### UNIT-II

#### **Hardware:**

CPU their generations and performance parameters, Input, output and storage devices. Primary (Main) Memories (RAM, ROM, Types of RAM and ROM, Cache Memory, Registers and types of registers, Storage Evaluation Criteria, Memory Capacity), Secondary Storage Devices: (Magnetic Disk, Floppy and Hard Disk, USBs, Optical Disks CD-ROMs)

#### **Software:**

Types: System Software (Machine Level Languages, Operating Systems, Device Specific Drivers), Higher Level Languages, and Applications

### UNIT-III

Languages: Machine Language, Assembly Languages, Programming Languages. Use of Compilers, Assemblers, Linkers, Loaders and interpreters in programming languages

Operating System: Booting/Start Up Procedure of machines, Introduction to Operating System, Functions and Classification of Operating Systems, Basic introduction to DOS, UNIX/LINUX OS, Windows

HTML, Use of Multimedia, Computer aided teaching and testing  
Application Software MS office (Word, Excel and Powerpoint)

### UNIT-IV

**Basic Introduction to Computer Networks:**

  
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Data Communication, Network devices (Hub, Switches, Modems, and Routers etc), LAN, LAN topologies, WAN, MAN, Internet: Introduction, Basics of E-mail, Web browsers (IE, Google Chrome, and Mozilla Firefox), Structure of Universal Resource Locator, Domains (.com, .in, .country specific, .org and rationale behind them), IP address, Backbone network, Network connecting devices, HTTP, DNS, Network Security and Search Engine.

  
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## ENZYMOLGY AND CLINICAL BIOCHEMISTRY

PAPER CODE-05270301

B. Sc. Semester III (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### Unit-I

**Structure, Functioning and importance of enzymes in health and disease**  
Introduction, definition, Classification and mechanism of action of enzymes, Factors affecting enzyme activity, Clinical importance of enzymes and iso enzymes, Use of enzymes as reagents

### Unit II

**Plasma proteins:** Major classes of Plasma proteins, Synthesis of Plasma proteins, Function of Plasma Proteins, Separation of Plasma Protein.

### Unit III

**Integration of Metabolism and Metabolism in Starvation:** Definition and Significance of Integration of Metabolism, Integration of Metabolism at Cellular and Tissue or Organ Level, Blood glucose regulation, Metabolism in Starvation, Phases of Starvation and Diabetes.

### Unit IV

**Metabolic intermediates:** Introduction to Non-protein nitrogenous compounds, urea/BUN: Synthesis, clinico-pathological correlations and estimations, Creatin and creatinine: Synthesis, clinico-pathological correlations and estimations, Uric acid: Synthesis, clinico-pathological correlations and estimations, Ammonia, Porphyrins.

### Unit V

**Mineral & Metabolic Bone Diseases:** Metabolism of Calcium, Phosphorus, Sulfur etc. Metabolism of Trace elements. Bone metabolism, Markers of bone metabolism.

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## ENZYMOLGY AND CLINICAL BIOCHEMISTRY

### -PRACTICAL

PAPER CODE-05270302

B. Sc. Semester III (MLT)

L T P Credits  
- - 2/4

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

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Auto pipettes

Working and calibration of auto pipettes of different types

Estimation on semi automated Biochemistry analyzers

Standardization and calibration of semi automated, Biochemistry Analyzers

Estimation of various biochemical parameters by using semi automated biochemistry analyzers :

Lipid Profile, Glucose, Calcium and Phosphorus

Blood collection and Separation of serum and plasma.

Estimation of glucose by GOD POD method.

Estimation of urea by Urease (Berthelot) test.

Estimation of uric acid by Uricase/PAP method.

Urine analysis

Analysis of urine for abnormal constituents

## MYCOLOGY AND PARASITOLOGY

PAPER CODE-05270303

B. Sc. Semester III (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### UNIT-I

Mycology: Morphology and Classification of fungi.

Lab diagnosis of fungal Infections: stainings, culture media and conventional mycological techniques

### UNIT-II

Superficial Mycoses: Dermatophytes, Malassezia

Subcutaneous Mycoses: Mycetoma, Rhinosporidium and Sporotrichosis

Systemic Mycoses: Histoplasmosis, Blastomycosis, Cryptococcosis

Opportunistic Fungi: Aspergillosis, Pencilliosis, Zygomycosis, Candidiasis, Pneumocystis

### UNIT-III

Parasitology I: Classification and morphology of Protozoa

Structure, life cycle pathogenesis & laboratory diagnosis of-Entamoeba, Trichomonas and Giardia,

Plasmodium, Leishmania, Toxoplasma, Cryptosporidium & coccidian parasites

### UNIT-IV

Parasitology II: Classification and morphology of Helminthes- Taenia, Echinococcus,

Ascaris, Ancylostoma, Strongyloides, Trichuris, &Enterobius, Filaria

  
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## MYCOLOGY AND PARASITOLOGY-PRACTICAL

PAPER CODE-05270304

B. Sc. Semester III (MLT)

L T P Credits  
- - 2/4

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

### Myiology::

1. Demonstration of fungi using KOH , Lactop henol cotton blue and India ink
2. Colony characteristics and Microscopic examination and identification tests for :
3. Candida and Cryptococcus,
4. Dermatophytes
5. Aspergillus sp
6. Miscellaneous fungi
7. Slide culture technique

### Parasitology

1. Stool examination: Saline mount, Iodine mount
2. Stool concentration techniques
3. Preparation of thick and thin smears
4. Preparation and staining technique of Leishman's stain and Giemsa stain
5. Demonstration of malarial parasite in peripheral smear
6. Rapid test for malaria and QBC

  
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## **FUNDAMENTALS OF HISTOLOGY, CYTOLOGY AND HEMATOLOGY**

**PAPER CODE-05270305**

**B. Sc. Semester III (Medical Laboratory Technology)**

**L T P Credits**  
**3 1 - 4**

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**  
**Duration of Examination: 3 Hours**

### **UNIT-I**

#### **Fundamentals of applied histology**

Microscopy – working principle, maintenance and applications, & various types of microscope.  
Dark ground microscope, Polarizing microscope, Phase contrast microscope, interference microscope, U.V light microscope.  
H&E Stain & its importance.  
Connective tissue stain, trichrome staining and other special stains.  
Principle of metal impregnation techniques.  
Principles of immunohistochemistry and its techniques.

### **UNIT-II**

#### **Cytology**

Stains cytological preparation with special emphasis on MGG, Papanicolour Stains.  
Special stains like PAS, Mucicarmine, Alcian blue.  
Cytological screening and quality control in cytology laboratory.

### **UNIT-III**

#### **Haematology**

Hematopoiesis & stem cell.  
Aneamias:- Types, classification, definition & microcytic hypochromic & macrocytic anemia  
Bone marrow aspiration composition and function  
Staining of bone marrow smears and preparation of histological section

### **UNIT-IV**

Haemoglobin:- Its synthesis, functions and degradation  
Haemoglobin pigments and their measurement  
Abnormal haemoglobins and their means of identification & estimation  
LE Cell phenomenon, and various methods of its demonstration.  
Coagulation factors.  
Haemostatic mechanism and theories of blood coagulation & Hemophilia  
Preparation of packed cells and various fraction of blood for transfusion purposes

  
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**FUNDAMENTALS OF HISTOLOGY, CYTOLOGY AND HEMATOLOGY-PRACTICAL**

**PAPER CODE-05270306**

**B. Sc. Semester III (MLT)**

**L T P Credits**  
**- - 2/4**

**Examination: 30 Marks**  
**Int. Assessment: 20 Marks**  
**Total: 50 Marks**

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1. Coomb's test direct & indirect.
2. Urine – Microscopic examination.
3. Reticulocytes, count - preparation, staining & corrected retic count.
4. Semen analysis- physical and chemical & microscopy with Methylene blue staining for morphology.
5. Body fluid analysis (CSF, Pleural, Peritoneal/ascetic fluid)- Physical, Chemical, M/E.

  
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## ENVIRONMENTAL STUDIES

PAPER CODE-05270307

B. Sc. Semester III (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### Unit 1:

The Multidisciplinary nature of environmental studies

- Definition, scope and importance.
- Need for public awareness.

Natural Resources

Renewable and non-renewable resources: Natural resources and associated problems.

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

### Unit 2:

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.

Biodiversity and its conservation

- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

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### **Unit 3:**

#### **Environmental Pollution**

Definition, causes, effects and control measures of:-

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Fireworks, their impacts and hazards
- Pollution case studies.
- Disaster management : floods, earthquake, cyclone and landslides.

### **Unit 4 :**

#### **Social Issues and the Environment**

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions.
- Consumerism and waste products.
- Environmental Legislation (Acts and Laws)
- Issues involved in enforcement of environmental legislation

#### **Human Population and the Environment**

- Population growth, variation among nations with case studies
- Population explosion – Family Welfare Programmes and Family Planning Programmes
- Human Rights.
- Value Education.
- Women and Child Welfare.

  
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## **MEDICAL EMERGENCIES AND PATIENT CARE**

PAPER CODE-05270308

B. Sc. Semester III (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### **Unit – I: Introduction to Emergency Services**

Organization of Emergency Department, Guidelines in Emergency, Clinical Monitoring, Fluid Therapy and Blood Transfusion, Airway Management, Cardiopulmonary Resuscitation, Principal of Mechanical Ventilation, Injection – An Infusion Method, Acid Base and Electrolyte Imbalance

### **Unit – II: Handling of Different Emergencies**

Cardiogenic Shock, Congestive Cardiac Failure, Myocardial Infarction, Head Injuries, Vasovagal Syncope, Seizer, Epilepsy, Conjunctival and Corneal Foreign Body, Foreign Body in Nose & in Ear, Epistaxis, Asthma, COPD, Haemoptysis, Rib Fracture, Tear Gas Exposure, Food Poisoning, Diarrhea, Urine Retention, Blunt Scrotal Trauma, Hypo & Hyperthermia

### **Unit – III: Fundamentals of Patient Care**

Concept of health & Illness, Health Determinants, Concept of Patients & Their Types, Patient Centred Care & Fundamentals of Communications, Reporting & Recording of Patients, Rights of Patients, Concepts of Disease & Its Types, General Concept, Care & Prevention of Accident, Trauma & Infections

### **Unit – IV: Patient Care, Associated Units & Departments**

Ambulatory Units, Critical Care Units, Paediatric, Neonatal Intensive Care Unit (NICU), Emergency Department, Inpatient Units, Haematology/Oncology and Immunology Unit, Orthopaedic Unit, Psychiatry Unit, Neurology and Neurosurgical Unit, Renal, Dialysis Unit, Gastroenterology/Endocrinology Unit, Life Flight Critical Care Transport Program, Radiology Department, Surgical Units, Cardiac Catheterization Lab, Operating Room, Post Anaesthesia Care Unit, Managing patients with disabilities, Geriatric Care, Care of Critically Ill Patients, Tracheotomise Patients, Nutritional Support in ICU

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## ENZYMOLOGY AND CLINICAL BIOCHEMISTRY-II

PAPER CODE-05270401

B. Sc. Semester IV (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### Unit I

**Clinical enzymology & biomarkers:** – Clinical enzymology, plasma lipid profile, hypolipoproteinemias, hyperlipidemias, Cardiac markers-creatine kinase (CK-MB), cardiac troponins, high sensitive TnT, AST & LDH, Markers of Muscle diseases-creatine kinase (CK-MM), aldolase, Markers of bone disease- Alkaline phosphatase, heat labile bone isoenzymes, Prostate markers- prostate specific antigen, acid phosphatase, Miscellaneous enzymes-Glucose-6-phosphate dehydrogenase, urease, glucose oxidase & peroxidase.

### Unit-II

**Diseases and Organ function tests:** Kidney function tests, Liver function tests, Thyroid function tests, Pancreatic function tests, Diabetes Mellitus, Porphyrias, Jaundice, Atherosclerosis, Myocardial infarction, Nephrotic and Nephritic Syndrome

### Unit III

**Specimen Collection & Reports Release:** Types of Specimens, Method of specimen collection (Blood, serum, Urine and others), Separating the serum and plasma, Use of preservatives in specimen collection, Use of proper Anticoagulants in specimen collection, Analyzing and releasing final Biochemistry reports, Precautions required before release of reports

### Unit IV

**Acid-Base balance & pH:** - Buffers of body fluids, respiratory regulation of pH, renal regulation of pH, disturbances in acid-base balance- metabolic acidosis, metabolic alkalosis, Respiratory acidosis & alkalosis, anion gap, determination of blood pH & gases.

  
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## ENZYMOLGY AND CLINICAL BIOCHEMISTRY-II

### -PRACTICAL

PAPER CODE-05270402

B. Sc. Semester IV (MLT)

L T P Credits  
- - 2/4

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

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Estimation on semi automated Biochemistry analyzers

Standardization and calibration of semi automated, Biochemistry Analyzers

Estimation of various biochemical parameters like using semi automated biochemistry analyzers

-LFT

KFT

Cardiac markers (CK-MB and CK total)

GTT and GTC

24 hour urinary creatinine, calcium and proteins

Blood Gas Analysis

Standardization and calibration of Blood Gas Analyzer

**Blood -Gas Analysis and reporting**

Quality control

Various quality control measures used in the laboratory and how to maintain the quality

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## **VIROLOGY, SPECIMEN HANDLING AND APPLIED MICROBIOLOGY**

**PAPER CODE-05270403**

**B. Sc. Semester IV (Medical Laboratory Technology)**

**L T P Credits**  
**3 1 - 4**

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**  
**Duration of Examination: 3 Hours**

### **UNIT-I**

Virology I: General properties of Viruses ,Collection, transportation and storage of samples for viral diagnosis, Cultivation of viruses.

Morphology, replication, clinical features and laboratory diagnosis of Bacteriophages, Herpes viruses , Viral Hepatitis, Human Immunodeficiency Viruses , Rabies,

### **UNIT-II**

Virology-II Morphology, replication, clinical features and laboratory diagnosis of: Poliomyelitis, Influenza Viruses, Rubella, Mumps , Measles, Rota virus, Japanese encephalitis & Dengue Chikungunya, Kyasanur Forest disease ,Human Onocogenic Viruses.

### **UNIT-III**

Specimen processing -Blood, Sputum, throat swab, nasopharyngeal swab, Swabs (pus, wound ), CSF and other body fluids, Stool and rectal swabs.

### **UNIT-IV**

Applied Microbiology-Hospital infection control, Healthcare associated infections  
Emerging infectious diseases, Zoonosis, Bacteriology of Water, Milk, and Air

  
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**VIROLOGY, SPECIMEN HANDLING AND APPLIED MICROBIOLOGY**

**-PRACTICAL**

**PAPER CODE-05270404**

**B. Sc. Semester IV (MLT)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Examination:</b>	<b>30 Marks</b>
-	-	2/4		<b>Int. Assessment:</b>	<b>20 Marks</b>
				<b>Total:</b>	<b>50 Marks</b>

- I. Spot tests/ELISA : HBV,HCV,HIV, Dengue X2
  - II. Demonstration of embryonated egg inoculation
  - III. Demonstration of cell culture techniques and Cytopathic effect
- Demonstration of heamagglutination and heamagglutination inhibition assay

  
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## GENERAL PATHOLOGY AND TRANSFUSION MEDICINE

PAPER CODE-05270405

B. Sc. Semester IV (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### UNIT-I

#### General Pathology

Inflammation:- Definition, causes, types & various cells of inflammation.

Immunity:- Definition, types of antigens & various types of antibodies.

Hypersensitivity:- Definition with types & examples.

### UNIT-II

Neoplasia:- Definition, classification, difference between benign & malignant tumors in brief, various modes of invasion and diagnosis in brief.

Infections:- Malaria, tuberculosis, dengue & AIDS in brief.

Nutritional diseases:- Fat & water soluble vitamins, Rickets, Scurvy.

### UNIT-III

#### Fundamentals of transfusion Medicine:

Compatibility of tests in blood transfusion.

Complications and hazard of blood transfusion

Blood groups:- Types & Bombay blood group

Blood donor selection

Methods of bleeding donors

Blood containers, anticoagulants and storage of blood

Coomb's test and its significance

Screening of blood for infective material

Blood components, preparation & component therapy

Transfusion reactions and work up

Blood bank organization, standards, procedures, techniques and quality control.

### UNIT-IV

Coomb's test and its significance

Screening of blood for infective material

Blood components, preparation & component therapy

Transfusion reactions and work up

Blood bank organization, standards, procedures, techniques and quality control.

Laboratory investigation of transfusion reactions and mismatched transfusion.

Various component of blood:- Separation & its uses.

**GENERAL PATHOLOGY AND TRANSFUSION MEDICINE-PRACTICAL**

**PAPER CODE-05270406**

**B. Sc. Semester IV (MLT)**

**L T P Credits**  
- - 2/4

**Examination: 30 Marks**  
**Int. Assessment: 20 Marks**  
**Total: 50 Marks**

1. Sickling test for sickle cell anemia.
2. Osmotic fragility test.
3. LE Cell preparation & estimation.
4. PT & APTT Test.
5. BT & CT Test with clot retraction time.

  
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## **DIAGNOSTIC ENDOCRINOLOGY**

**PAPER CODE-05270501**

**B. Sc. Semester V (Medical Laboratory Technology)**

**L T P Credits**  
**3 1 - 4**

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**  
**Duration of Examination: 3 Hours**

### **Unit I**

**Introduction and classification of hormones, difference between hormones and enzymes, Regulation and general mechanism of action of hormones, Diagnostic endocrinology techniques- ELISA, RIA, chemiluminescence assay**

### **Unit II**

**Pituitary gland & hypothalamus, hormones of the Anterior Pituitary- Growth hormone, Prolactin, Gonadotropin, Follicle Stimulating hormone, Leuteinizing Hormone, Thyroid stimulating hormone (TSH), Adrenocorticotrophic hormone (ACTH)**

### **Unit III**

**Thyroid hormones – T3, T4, PTH, disorders, Neurohypophysis hormones-Oxytocin, Antidiuretic hormone,**

### **Unit IV**

**Kidney, pancreatic and Gonads hormones -Renin, Adrenal gland hormones-Aldosterone, Glucocorticoids, Mineralocorticoids, cortisol and disorders associated with them di. Insulin, glucagon, somatostatin and disorders associated with them. Testosterone, Estrogens, Progesterone, Human Chorionic Gonadotropin (HCG), disorders associated with them.**

  
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**DIAGNOSTIC ENDOCRINOLOGY-PRACTICAL**

**PAPER CODE-05270502**

**B. Sc. Semester V (MLT)**

**L T P Credits**  
**- - 2/4**

**Examination: 30 Marks**  
**Int. Assessment: 20 Marks**  
**Total: 50 Marks**

**Estimation of TSH in a given sample by ELISA**

**Estimation of T3 in a given sample by ELISA**

**Estimation of T4 in a given sample by ELISA**

**Estimation of Prolactin in a given sample by ELISA**

**Estimation of Estradiol in a given sample by ELISA**

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## **IMMUNOLOGY AND APPLIED MICROBIOLOGY**

**PAPER CODE-05270503**

**B. Sc. Semester V (Medical Laboratory Technology)**

**L T P Credits**  
**3 1 - 4**

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**  
**Duration of Examination: 3 Hours**

### **UNIT-I**

Immunology: Immunity, Components of immune system- Organs of immune system, B Lymphocytes and plasma cells, T lymphocytes and their subsets and Natural killer cells, Macrophages and dendritic cells. Immune responses

### **UNIT-II**

Types of hypersensitivity reactions, Autoimmunity, Cytokines, Antigen & Antibody Complement, Types of antigen-antibody reactions-Precipitation, Agglutination, Complement Fixation Test, Neutralization, ELISA, Immunofluorescence, Radioimmunoassay, Monoclonal Antibodies, Transplantation immunology and HLA typing

### **UNIT-III**

Laboratory Diagnosis of: Urinary Tract Infections, Diarrhea & Dysentery, Meningitis, Blood stream infection, Respiratory infection, Sexually Transmitted Diseases, Viral hepatitis, HIV, Skin, soft tissue & wound infection.

### **UNIT-IV**

Molecular techniques in diagnostic microbiology-PCR and its types.  
Biomedical waste management, Biosafety levels and biosafety cabinets  
Health care associated infections, Occupationally acquired infections in health care settings  
Maintenance of laboratory records, Audit

  
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## IMMUNOLOGY AND APPLIED MICROBIOLOGY-PRACTICAL

PAPER CODE-05270504

B. Sc. Semester V (MLT)

L T P Credits  
- - 2/4

Examination: 30 Marks  
Int. Assessment: 20 Marks  
Total: 50 Marks

Antibiotic sensitivity testing-Kirby Bauer method

Immunology Serological tests

Specimen collection, Principle, Methods, Procedure

Demonstration of HIV, HCV, HBC, Dengue,

Rapid test for Malaria,

Demonstration of ASO, CRP, RA, Widal, VDRL, Typhidot

Applied

Biomedical Waste management and maintenance of equipment

Hanging drop preparation

Culture methods

Introduction to biochemical reactions

Identification of bacterial culture

i) Colony characteristics

ii) Morphological characteristics

iii) Motility study

Interpretation of biochemical reactions

Antibiotic sensitivity testing-Kirby Bauer method

  
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## **APPLIED HISTOLOGY, CYTOLOGY AND CYTOGENETICS**

**PAPER CODE-05270505**

**B. Sc. Semester V (Medical Laboratory Technology)**

**L T P Credits**  
**3 1 - 4**

**Examination: 30 Marks**  
**Int. Assessment: 20 Marks**  
**Total: 50 Marks**  
**Duration of Examination: 3 Hours**

### **UNIT-I**

#### **APPLIED HISTOLOGY**

Handling of fresh histological specimens (Tissues).  
Lipids-identification and demonstration.  
Micro-organism in the tissues-various staining, techniques for their demonstration and identification.  
Immunohistochemistry-common antigens and their applications.  
Electron microscope, working principles, components and allied techniques for electron microscopy.  
Museum techniques.

### **UNIT-II**

#### **Cytology**

Cervical cytology :- Basis of detection of malignant & premalignant lesion.  
Aspiration cytology:- Principles, indications and utility of the techniques  
Staining:- Pap stain, H&E stain & Giemsa stain.  
Cytology of various body fluids.

### **UNIT-III**

#### **Cytogenetics**

Introduction, terminology, classification & nomenclature.  
Blood groups:- Types & Bombay blood groups.  
Sex chromatin & identification  
Chromosomes in neoplasia & oncogenes/anti-oncogenes.  
Culture of bone marrow cells and peripheral blood lymphocytes.  
Characterization of human chromosome by various banding techniques

### **UNIT-IV**

#### **Immunopathology**

Cells of the immune system  
Immunoglobulins, antibodies and humoral immune response.  
Auto immune disease & investigation  
Infection and the immune system  
Cancer immunology  
Tissue typing for kidney transplant.  
HLA Antigen  
Various grafts & graft versus host disease (GVHD).



## **UNIT-V**

### **Haematology**

Definition and classification of hemolytic anaemias :- Sickle cell anemia & Thalassemia

Laboratory investigation for haemolytic anaemia including classification & causes.

Leukemia; definition and classification

Laboratory investigations for disseminated intravascular coagulation (DIC), Hemophilia

Mechanism of fibrinolysis; tests for fibrinolysis.

Platelet function test and their interpretation.

Electrophoresis :- Principles and application in hematology

## **APPLIED HISTOLOGY, CYTOLOGY AND CYTOGENETICS-PRACTICAL**

**PAPER CODE-05270506**

**B. Sc. Semester V (MLT)**

**L T P Credits**  
- - 2/4

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**

1. Plasma hepatoglobin
2. Hemosiderinuria
3. Fetal hemoglobin
4. Electrophoresis of various hemoglobin
5. Sickening test
6. Investigation for G6PD Deficiency

  
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## RESEARCH METHODOLOGY AND BIOSTATISTICS

PAPER CODE-05270507

B. Sc. Semester V (Medical Laboratory Technology)

L T P Credits  
3 1 - 4

Examination: 60 Marks  
Int. Assessment: 40 Marks  
Total: 100 Marks  
Duration of Examination: 3 Hours

### UNIT-I

#### **Introduction**

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

### UNIT-II

#### **Tabulation of Data**

Raw data, the array, frequency distribution  
Basic principles of graphical representation  
Types of diagrams - histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, Normal probability curve

### UNIT-III

#### **Measure of Central Tendency**

Introduction: Uses, applications and practical approach  
Definition and calculation of mean - ungrouped and grouped data  
Meaning, interpretation and calculation of median ungrouped and grouped data  
Meaning and calculation of mode  
Comparison of the mean, and mode  
Guidelines for the use of various measures of central tendency

### UNIT-IV

#### **Measure of Variability**

Introduction: Uses, applications and practical approach  
The range, the average deviation or mean deviation  
The variance and standard deviation  
Calculation of variance and standard deviation for ungrouped and grouped data  
Properties and uses of variance and Standard deviation

## UNIT-V

### **Sampling Techniques**

Introduction: Uses, applications and practical approach

Criteria for good samples

Application of sampling in Community

Sampling methods, sampling and non-sampling errors

Sampling variation and tests of significance

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## **HOSPITAL MANAGEMENT AND MEDICAL ETHICS**

**PAPER CODE-05270508**

**B. Sc. Semester V (Medical Laboratory Technology)**

**L T P Credits**  
**3 1 - 4**

**Examination: 60 Marks**  
**Int. Assessment: 40 Marks**  
**Total: 100 Marks**  
**Duration of Examination: 3 Hours**

### **UNIT-I**

**Introduction to hospital staffing- Hospital staffing, administration, HIS.**  
**Medical records and documentation- Medical records and documentation**

### **UNIT-II**

**Legal & medical issues Legal issues in Laboratories**  
**Ethical issues, patient rights, patient responsibility, legal concerns, History taking, patient monitoring, inform consent, mal-practice, patient privacy issues.**  
**Professional ethics- Professional ethics and Code of conduct of Lab technicians**

### **UNIT-III**

**Handling of patients Seriously ill and traumatized patients, visually impaired, hearing and speech impaired patients, mentally impaired patients/ psychologically issues, infectious patients, critical/trauma patients, pregnant patient, patient with implant. Handling of patient with life threatening diseases like HIV, STD, HBSAG, etc**

### **UNIT-IV**

**Departmental Safety & Infection Control**  
**Infection control Skin care, donning of gowns, gloves, face masks, head caps, shoe covers**  
**First aid- Artificial respiration, hemostasis, first aid techniques, ABCD management**

  
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## **TOOLS AND TECHNIQUES IN MOLECULAR BIOLOGY & BIOCHEMISTRY**

**B. Sc. Semester V (Medical Laboratory Technology)**

L	T	P	Credits
4	-	-	4

Examination:	60 Marks
Int. Assessment:	40 Marks
Total:	100 Marks
Duration of Examination:	3 Hours

**Unit-I :** Nucleic acid extraction Isolation of nucleic acids, Extraction of genomic DNA & plasmid DNA by boiling lysis method, alkaline lysis method, by Kit methods, RNA extraction, Qualitative and quantitative estimation of DNA & RNA.

**Unit II:** Polymerase Chain Reaction Polymerase chain reaction, Nested PCR, Colony PCR, Assembly PCR, touchdown PCR, multiplex PCR, Hot start PCR, Methylation specific PCR, LAMP Assay, Methods for synthesis of double strand cDNA, RT PCR and Real Time PCR, DNA sequencing by Maxam Gilbert method and Sanger's dideoxynucleotide method, RFLP, RAPD.

**Unit-III:** Protein purification techniques Salting in, Salting out, Dialysis, Chromatography: Principles of chromatography, Paper chromatography, Thin Layer Chromatography, Gel filtration Chromatography, Ion exchange Chromatography, Affinity chromatography, Hydrophobic interaction, Reverse-phase chromatography, HPLC, Gas chromatography.

**Unit IV:** Spectroscopic Techniques, Electrophoresis and Blotting Lambert Beer's Law, Analysis of biomolecules using UV/visible spectrophotometer, fluorescence, circular dichroism. Electrophoresis, types of electrophoresis. Polyacrylamide and Agarose gel electrophoresis; Capillary electrophoresis; 2D Electrophoresis; Isoelectric focusing, Southern Blotting, Northern Blotting and western Blotting.