SunRise University
Approved by Govt. of Rajasthan vide Sunrise University Act, 2011
Recognized by UGC Act, 1956 u/s 2 (f)

Master of Vocation (Medical Laboratory Technology)
M.Voc. (MLT) Syllabus Year 1 (PG Diploma)

FIRST SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVMLT101	Human Anatomy & Physiology	40	60	100
MVMLT102	Clinical Biochemistry	40	60	100
MVMLT103	Clinical Pathology	40	60	100
MVMLT104	Clinical Microbiology	40	60	100
PRACTICAL				
MVMLT105	Human Anatomy & Physiology Lab	60	40	100
MVMLT106	Clinical Biochemistry Lab	60	40	100
MVMLT107	Clinical Pathology Lab	60	40	100
MVMLT108	Clinical Microbiology Lab	60	40	100
Total		**400**	**400**	**800**

SECOND SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVMLT201	Physiology & Nutrition	40	60	100
MVMLT 202	Biostatistics & Hospital Management	40	60	100
MVMLT 203	Clinical Hematology	40	60	100
MVMLT 204	Advance Instrumentation & Maintenance	40	60	100
MVMLT 205	Communication & Soft Skills	40	60	100
PRACTICAL				
MVMLT 206	Physiology & Nutrition Lab	60	40	100
MVMLT 207	Clinical Hematology Lab	60	40	100
MVMLT 208	Advance Instrumentation & Maintenance Lab	60	40	100
Total		**380**	**420**	**800**

Master of Vocation (Medical laboratory technology)
M. Voc. (MLT) Syllabus Year 2 (Master Degree)
THIRD SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVMLT301	Lab Management	40	60	100
MVMLT302	Blood Transfusion & Immune hematology	40	60	100
MVMLT303	Histopathology	40	60	100
MVMLT304	Diagnostic Microbiology	40	60	100
MVMLT305	Corporate Communication	40	60	100
PRACTICAL				
MVMLT306	Blood Transfusion & Immune hematology Lab	60	40	100
MVMLT307	Histopathology Lab	60	40	100
MVMLT308	Diagnostic Microbiology Lab	60	40	100
Total		**380**	**420**	**800**

FOURTH SEMESTER

PAPERS CODE	PAPERS NAME	INTERNAL	EXTERNAL	TOTAL
MVMLT401	Basic Cellular Pathology & Allied Technology	40	60	100
MVMLT402	Hematology & Clinical Pathology	40	60	100
MVMLT403	Anatomy &Histotechnology	40	60	100
MVMLT404	Pathology & Cytology	40	60	100
PRACTICAL				
MVMLT405	Hematology & Clinical Pathology Lab	60	40	100
MVMLT406	Anatomy & Histotechnology Lab	60	40	100
MVMLT407	Pathology & Cytology Lab	60	40	100
Total		**340**	**360**	**700**

Master of Vocation (Medical Lab Technology (Pathology))
M. Voc. 1st YEAR (Sem I)

Human Anatomy &Physiology
ClinicalBiochemistry
ClinicalPathology
ClinicalMicrobiology

Practical
Human Anatomy & Physiology
Clinical Biochemistry
Clinical Pathology
ClinicalMicrobiology

Master of Vocation (Medical Lab Technology (Pathology))
M. Voc. 1st YEAR (Sem II)

Physiology &Nutrition
Biostatistics & HospitalManagement
ClinicalHematology
Advance Instrumentation&Maintenance

Practical
Physiology & Nutrition
Clinical Hematology
Advance instrumentation &Maintenance

Master of Vocation (Medical Lab Technology (Pathology))
M. Voc.
2nd YEAR (Sem III)

LabManagement
Blood Transfusion & immunehematology
Histopathology
DiagnosticMicrobiology

Practical
Blood Transfusion & Immunohematology
Histopathology
DiagnosticMicrobiology

Master of Vocation (Medical Lab Technology (Pathology)) M. Voc.

2nd YEAR (Sem IV)

Basic Cellular Pathology & AlliedTechnology
Hematology & ClinicalPathology
Anatomy & His toTechnology
Pathology & cytology Technology Dissertation (Pathology) &Viva

Practical
Hematology & Clinical Pathology
Anatomy & His to Technology
Pathology &CytologyTechnology

M. Voc. (MLT) Pathology- scheme and syllabus

Scope and Objective

Post Graduate skill developing programme in Medical Laboratory Technology – Pathology gives Opportunity for specialized study in the field of Laboratory Technology for B.Voc. (MLT) Graduates.Candidates who successfully complete M.Voc. (MLT) course may obtain jobs as
Specialized technologist in Pathology or supervisors of clinical laboratories inHospitals.
Laboratory scientists in Biomedical and researchinstitutes.
Teachers in training institutes of Medical LaboratoryTechnology.
Utilize or apply the concepts, theories and principles of laboratoryscience.
Demonstrate the ability to plan an effect the change in laboratory practice andHealth care deliverysystem.
Establish collaborative relationship with members of otherdisciplines.
Demonstrate interest in continued learning and research for personal andProfessionaladvancement.

Eligibility for admission

Candidates who have passed the B.Voc.(MLT) degree of any of theUniversities

Duration of the programme

Course of study including thesis work shall be for a period of two years.

Job Prospects: The Medical Laboratory Technologists/ technician may be assigned to a specialized area of work in a large medical lab. In small labs, they may perform a variety of tests or all areas of lab work. They can also work as laboratory manager/ consultant/ supervisor, health care administrator, hospital outreach coordinator, laboratory information system analyst/ consultant, educational consultant/ coordinator/ director, health and safety officeretc.

M. Voc. M.L.T (PATHOLOGY) 1st YEAR (Semester- I)

PAPER:- 1 HUMAN ANATOMY & PHYSIOLOGY

PARAMEDICAL COURSE- MASTERS ANATOMY

UNIT-1

Introduction: Overview ofthe structure organization of the human body; anatomical terminologyof positions&locations, planes.

Cell: Cell morphology and diversity; introduction to ultra structure and function of cell organelles.

Skeletal Muscles: Major skeletal muscles of the head, neck, thorax, abdomen and upper and lowerlimbs.

General Osteology: General morphology of bones; structural classification of bones, development and growth of skeletal tissue and bones.

General Astrology: Structural and functional classification of joints; general morphology of a synovial joint and associated structures; movements made available by synovial joints.

Detailed Osteology and Astrology Practical: Naming and identification of osteological features of individual human bones; Bones of Upper limbs – Clavicle, Scapula, Humerus, Radius, Ulna; Lower limbs – Femur, Hip bones, Sacrum, Tibia, Fibula, Ribs, Sternum Vertebral Column. Naming, identification and application of classification to the major joints of the human body; examples of variability in the human skeleton.

UNIT-2

Cardiovascular System:Macroscopicfeatures,functionandlocationoftheadultandthe locationofmajorarteriesandveins;macroscopicfeathersofbloodvesselsincludingarteries, veinsandcapillaries; morphological featuresofthe cellularcomponentsofblood.

Lymphatic System: Macroscopic features, major function and location of the lymphatic vascular structures, lymph nodes, tonsils and other mucosa-associated lymphatic tissue, spleen and thymus; microscopic anatomy of lymph nodes.

Nervous System: Macroscopic features and major functions of the brain brief structure, location & function of cerebrum, cerebellum & brain stem and spinal cord; morphological features and major function of the contents of the peripheral nervous system and autonomic nervous system.

Respiratory System: Macroscopic features and major functions of the nasal cavity, paranasal sinuses, pharyns, larynx, trachea, bronchi, lungs and thoracic wall including the thoracoabdominal diaphragm.

Digestive System: Macroscopic features and major functions of the mouth, salivary glands, pharynx, oesophagus, stomach, small and large intestines, liver pancreas, biliary system and peritoneal cavity.

UNIT-3

Urinary System: Macroscopic features, major functions and location of the kidneys, ureters, urinary bladder and theurethra.

Endocrine System: Macroscopic features, location and basic function of the hypothesis cerebri, thyroid gland, parathyroid glands, suprarenal glands, pineal gland and organs with a minor endocrine function.

Male Reproductive System: Macroscopic features, Major functions and location of the scrotum, testes, epididymis, ductus deferens, inguinal canal, seminal vesicles, prostate gland, bulbourethraj gland and penis.

Female Reproductive System: Macroscopic features, major functions and location of the ovaries, uterine tubes, uterus, vagina and external genitalia.

Special Senses: Macroscopic features and major functions of the contents of the orbital cavity, the eyeball, lacrimal apparatus, and external, middle and internal ear.

UNIT-4

Upper Limb: Relevant osteology; detailed plain radiographic anatomy of skeletally mature individuals.

Head and Neck: Relevant osteology of the skull and cervical vertebrae; surface anatomy, lymphatics major blood vessels and nerves of the head and neck; regional anatomy of the brain and its meninges.

UNIT-5

Histology: macroscopic and microscopic studies of epithelial tissue, general connective tissue, cartilaginous tissue, bone tissue, muscle tissue, nervous tissue and the integument; major functional advantages of each tissuetype.

Anatomy Practical:

Demonstration of bones identification and side determination upper limb-clavicle, scapula, humerus, radius, ulna, lower limb-femur, Hip bone, Tibia, Fibula, Vertebral Column, Ribs, Sternum,Sacrum
Demonstration ofheart.
Demonstration of different parts of respiratory system and normal X-rays-lungs.
Demonstration of the part of digestive system and normal X-rays- stomach, small intestine, large intestine,liver.
Embalming of human cadavers for teaching purposes & social/ funeralembalming.
Surface anatomy oncadaver.
Demonstration of major vessels of the body-Aorta, subclavian, carotid, brachial, radial, ulnar, femoral,renal.
Demonstration of bones & joints of the limb in normalX-ray.
Demonstration of major muscles of the body-limbs, head &neck.
Demonstration of other organs—spleen, testis,uterus.
Histology-General epithelium, connective tissue, gland, bone, cartilage lymphoidtissue
Systemic-Lung, Esophagus, Stomach, Small Intestine, Pancreas, Liver, Kidney, Pitutary Gland, Thyroid, Testis, Ovary.

PARAMEDICAL SYLLABUS – PHYSIOLOGY (M.Sc.)

General Physiology: Cell: Structure and function of a cell, Transport across the cell membrane, Passive Transport: Diffusion (Simple and Facilitated), Osmosis (Osmotic pressure, Tonicity), Active transport: Primary (Na^+K^+ ATPase), Secondary, Carrier type (Uniporters, Symporters, Antiporters), Vesicular (Endocytosis and Exocytosis), Tissues: Definition and classification (Epithelial, Connective, Muscular, Nervous), Body water and body fluids: Distribution of total body water, Ionic composition of body fluids, Concept of pH and H^+ concentration. The Membrane Potentials: Resting membrane potentials (Genesis & function), ActionPotential

Blood: Composition and functions of blood, Hemoglobin (Normal values and time), Blood Cells: RBC_s, WBC_s, Platelets (Development, structure and functions), Coagulation of blood and bleeding disorders, Haemophilia, Purpura, Blood groups (ABO, Rh) Uses, Lymphoid tissues (types) and immunity, Immune system (Natural and Acquired), Applied: Anaemia (Types), Jaundice, Hemophilia
Gastrointestinal Tract: Organization of structure of GIT, Functions of digestive system, Innervation of GIT (Enteric Nervous System). Mouth (Oral Cavity): Boundaries, Tongue, Teeth, Composition and functions of saliva, Mastication (chewing), Swallowing (Deglutition) Stages. Stomach: Structure, Functions of stomach and innervation, Composition and functions of gastric juice, Regulation of secretion of gastric juice, Gastric motility and emptying. Pancreas: Structure, Nerve supply, , Composition, functions and regulation of secretion of pancreatic juice. Liver: Structure, Functions and Liver function tests Bile: Composition, functions and control of secretion. Gall Bladder: Functions of gall bladder. Small Intestine: Intestine juice, Digestion and movements. Large Intestine: Structure, movements, absorption and secretion, dietary fibers. Digestion and absorption in GIT: Digestion and absorption of carbohydrates, lipids and proteins. Food and nutrition: constituents of a normal diet, Balanced diet, Applied aspect (Deficiency diseases, Kwashiorkar,Marasmus)

Respiratory System: Structure and functions of respiratory system, Air Passages: Nose and nasal cavity, pharynx, larynx, tracheobronchial tree, lungs, respiratory membrane, pleura, Properties of gases: Partial Pressure, composition of dry air, Functions of respiratory system: Lung defense mechanism and pulmonary circulation. Mechanics of respiration: Mechanism of breathing (Inspiration and Expiration), Alveolar Surface Tension (Actions of surfactant), Alveolar Ventilation: Dead space (Anatomical and Physiological), Diffusion capacity of lungs (Clinical Significance), Lung volumes and capacities (Static: Tidal Volume, Residual Volume, Vital Capacity, Total Lung capacity; Dynamic: FEV_1, FEV_2, FEV_3, Minute/Pulmonary Ventilation, Maximum Voluntary Ventilation). Transport of gases: Oxygen transport [Carriage of oxygen in blood; Dissolved form & combined with hemoglobin, Carriage of oxygen in the body; In tissues (At rest and during exercise), In lungs]. Carbon-di-oxide transport [Carriage of Carbon-di-oxideinblood;Indissolvedform,carbaminoform(InplasmaandRBC$_s$),asbicarbonate,CarriageofCarbon-dioxide in lungs], Oxygen hemoglobin dissociation curve (Shift to right & Shift to left).Regulation of respiration: Nervous Regulation of respiration [Automatic control via Medullary and Pontine Respiratory centers, Voluntary control of respiration], Genesis of respiration (Inspiration and Expiration), Factors affecting respiration [Chemical and non-chemical stimuli],Chemical Regulation of respiration [Peripheral chemoreceptors (Carotid bodies and Aortic bodies) and Central (Medullary) chemoreceptors]. Physio clinical aspects: Dyspnea, Apnea, Hypoxia

Cardiovascular System: General Cardiac chambers (Valves in the heart, Heart sounds, Pacemaker tissue of the heart), Properties of Cardiac Muscle, Cardiac Cycle, Electrocardiogram (ECG), Circulation: Functions, Pressure changes in vascular system, Organization and functions of vascular system, Distribution of major vessels in the body, Lymphatic system, Regulation of cardiovascular system:, Local (Basic Myogenic tone), Systemic: Chemical, Neural (Autonomic and medullary; Baroreceptors and Chemoreceptors) Heart Rate: Definition, Factors affecting HR and it's control, Cardiac Output: Definition, Distribution and control, Arterial Blood Pressure: Definition, factors affecting andregulation

Excretory System: Anatomy and Physiology of Urinary System, Kidney: Structure, Organization and functions of Glomerulus, Glomerular membrane, Blood supply Functions of kidney: Formation of urine, Regulation of water balance, Regulation of electrolyte balance, Regulation of acid-base balance, Endocrine functions of kidney, Urinary Passages: Ureters, Urinary Bladder (Structure and function, Higher control of micturation)

Endocrine System: Definitions, Control (Neural and endocrine), Characteristics of hormones, Pituitary Gland: Physiological anatomy (Anterior, intermediate and posterior lobe), Anterior Pituitary – Six Hormones (GH, PRL, TSH, ACTH, LH, FSH, Growth Hormone (GH): Control and actions, Applied (Gigantism, Acromegaly, Dwarfism), Prolactin (PRL): Control and actions of PRL, Posterior Pituitary, ADH (Anti diuretic hormone): Control of ADH secretion, Actions of ADH, Applied, Oxytocin: Actions and Control of oxytocin secretion, Intermediate lobe of Pituitary , MSH (Melanocyte stimulating hormone), Thyroid Gland: Physiological anatomy, Types of hormones (T3 and T4), Regulation of thyroid secretion, Actions of thyroid hormone: Calorigenic , On carbohydrate metabolism, On lipid metabolism, On growth and development, Effect on nervous system, Applied (Goiter, Hypothyroidism, Hyperthyroidism), Parathyroid, Calcitonin and Vitamin-D: Role of calcium in metabolic processes, Distribution, Absorption and fate of calcium in the body, Hormones regulating calcium metabolism (Vitamin-D, PTH, Calcitonin), Applied (Rickets, Osteomalacia& Adult Rickets, Hyperparathyroidism), Adrenal Cortex: Physiological Anatomy of adrenal gland, Regulation of glucocorticoid secretion, Actions of glucocorticoids, Cushing's Syndrome, Mineral corticoids (Aldosterone, Actions of aldosterone, Regulation of aldosterone secretion, Addison's Disease), Sex Hormones, Adrenal Medulla: Physiological Anatomy, Actions of catecholamine's, Actions (CVS, carbohydrate metabolism, lipid metabolism, BMR, CNS, Eyes, Urinary bladder, skin), Pancreas: Physiological Anatomy, Glucagon, Insulin (Actions), Applied (Diabetes Mellitus; Causes, Signs and symptoms), Thymus and Pineal Gland: Thymus: Functions, immunological role of thymus, Pineal gland: General features, Functions,control

Reproductive System: Physiology of reproduction: Sex determination and sex differentiation, Puberty: Control of onset and stages, reproductive hormones; Gonadotropin (FSH & LH), Male Reproductive System: Testis: Structure and functions, Spermatogenesis, Structure of the sperm, Seminal tract and related glands, supporting structure, seminal fluid (semen), Endocrine functions of testis (Testosterone, Control of testicular activity) Female Reproductive System, Female reproductive tract: Uterus and related structures, ovaries, ovarian hormones (Estrogen, Progesterone and Relax in) , Female Sexual Cycle: Changes in the ovaries and uterus (Menstrual cycle), Vagina and gonadotropin secretion Contraceptive measures

Central Nervous System: Organization and functions of nervous system Brain: Cerebral Hemisphere (Cerebrum), Basal Ganglia, Thalamus, Hypothalamus Brain stem: Midbrain, Pons, Medulla, Reticular formation, Cerebellum Spinal Cord: Structure and functions, Ascending (Sensory) tracts, Motor (Descending) tracts Cerebrospinal Fluid

Peripheral Nervous system, Somatic Nervous System: Spinal nerves, Reflexes, Mono and Polysynaptic reflexes, Cranial nerves, Autonomic Nervous system (ANS): Sympathetic and Parasympathetic

Special Senses: The Smell: Olfactory receptors, Olfactory pathway, Physiology of olfaction, The Taste: Taste Receptors (Taste buds), Taste Pathway, Physiology of taste The Ear: Physiological Anatomy (External ear, Middle Ear, Inner ear, Cochlea), Physical Properties of sound, Mechanism of hearing, The Eye: Physiological Anatomy (Sclera, Choroid, Retina, Crystalline lens, photoreceptors), Visual Pathway, Image forming mechanism of eye, Visual Acuity, Visual reflexes, Accommodation, Defects of image forming mechanisms, Lacrimal Apparatus (Lacrimal gland, Lacrimal canaliculi, nasolacrimal duct, tears

or Lacrimalfluid)
Skin and Temperature: Structure and function of skin, Temperature Regulation

Practical

Haemoglobinometry

White Blood Cellcount
Red Blood Cellcount
Determination of BloodGroups
Leishman's staining and Differential WBCcount
Determination of packed cellVolume
Erythrocyte sedimentation rate[ESR]
Calculation of Bloodindices
Determination of Clotting Time, BleedingTime

PAPER:- 2 CLINICAL BIOCHEMISTRY

Cell and Membrane: Basic structure and function of the cell. Structure of the cell membrane. Functions of the cell membrane Transport through the cell membrane: active, passive, facilitated. Membrane proteins andfunctions.

Chemistry of Carbohydrates: definition, classification. Isomerism, optical isomerism, Structural presentation of monosaccharide's, The various chemical reactions of carbohydrates and their derivatives. Disaccharides andpolysaccharides.

Chemistry of Lipids: definition, Classifications, properties , classifications. Fatty acids types anduses,Glycerides,Phospholipids,Glycolipids,Ecosanides,Steroids,Cholestrol,Lipoproteins, Amphipathic lipids and lipid bilayer.

Chemistry of Amino acids and proteins: definition of amino acids, Classification based on structure, requirement, metabolic fate, solubility, Physical properties of Amino acids, Chemical properties of amino acids. iso electric pH.Non standard aminoacids.

Proteins: Definition, Structure, structural classification, Functional classification. Peptide bonds an structural Motifs in protein such as A helix, B pleated sheets etc, Reactions of proteins such as denaturation, heat coagulation, salting out, reaction with acids, reactions with alkali, precipitations by heavy metals, precipitations by organic solvents, precipitation by alkaloid reagents.

Nucleotides and nucleic acids: Nucleotides, Purines and Pyrimidines. Sugars in nucleotides, DNA structure, Coiling and packaging of DNA, Histones, Genes and chromosomes. RNA types and structure ofRNA.

Vitamins: Fat soluble and water soluble vitamins, Uses of Vitamins, Deficiencydisorders.

Nutrition: Diet, calculation of balanced diet, disorders of protein energymalnutrition.

Water and electrolytes, Acid Base balance: ECF, ICF, Intra cellular and extra cellular electrolytes.Dehydration.Acidosis, alkalosis, Buffers, Means of maintaining pH.

Practical-Clinical Biochemistry

Laboratory safety : Fire, chemical, radiation ,handling of biological specimens,waste
Disposal regulations, workplacehazardous.
Specimen collection, identification, transport, delivery andpreservation.
Patient preparation fortests.
Anticoagulants' andpreservatives
Regulations and precautions regarding transport of biologicalspecimens
Preparation of high qualitywater
pHdetermination
Preparation of buffers and determination ofpH
Measurement ofradioactivity
Practical's related to solvent extraction, Partition coefficient, Dialysis,Concentration,
Desalting andUltracentrifugation.
Calibration of equipments and laboratorywares.
Familiarization and usage of Colorimetry, specterophotometry,fluorimetry,
flame photometry, atomic absorption spectroscopy, nephelometry,osmometry,
Chemiluminesence, ion selective electrodes, flowcytometry.
Chromatography : - Paper, Thin layer, Gel filteration, Ion exchange, HPLC,GLC,
Separationofvarioussugars,aminoacids,lipids,drugstoxinsetc.Urineaminogram.
Electrophoresis:-Paper,Agarosegel,Celluloseacetate,PAGE,SDS-PAGE.Separation
of serum proteins, lipoproteins, haemoglobin, globin chain andisoenzymes
Tissue homogenization and celldisruption
Cell fractionationmethods
Extraction of glycogen and itsestimation
Extraction of protein and itsestimation
Extraction of lipids and estimation of total lipids, glycolipid, phospholipids andcholesterol.
Determination of saponification number and iodine number fromoils
Estimation of lacticacid and pyruvicacid
Qualitative analysis ofcarbohydrate
Detection of unknownsugars
Qualitative analysis ofproteins
Isolation of DNA andRNA
Estimation of DNA andRNA
Agarose gel electrophoresis ofDNA

PAPER:- 3 CLINICAL PATHOLOGY

Examination of Urine - Routine and Specialtests
Examination of Stool - Routine and Specialtests
Examination of Sputum - Routine and Specialtests
Semen examination - Routine and Specialtests
Examination of CSF - Routine and Specialtests
Examination of various body fluids-Pleural Fluid, Pericardial Fluid, Synovial Fluid, AsceticFluid
Various methods of detecting HCGlevels
Structure and molecular organization ofChromosomes
Identification of humanchromosomes
Karyotyping
Direct chromosome preparation of Bone Marrowcells

Culturetechniques
Bandingtechniques
Sex Chromatinbodies
Autoradiography of humanchromosomes
Chromosome Identification by image analysis and Quantitativecytochemistry
Clinical Manifestations of chromosomedisorders
Anemia and other disorders ofErythropoiesis
Disorders ofLeucopoiesis
Homeostasis & itsinvestigations
Investigations of Thromboticstendency
Laboratory control of Anticoagulant , Thrombotic and plateletherapy
Collection and handling ofBlood
All Routine and special HematologicalInvestigations
Blood and Bone Marrowpreparations
Leucoproliferative disorders with special references toLeukemia
Automation inHematology
Cytochemistry of Leukemiccells
Amniocentesis
Bone marrowtransplantation
Application of differentMicroscopes
Preparations of various Reagents and Stains used inHematology
Immunophenotyping
Flowcytometry
Molecular techniques inHematology

Practical Clinical Pathology

Examination of Urine - Routine and Specialtests
Examination of Stool - Routine and Specialtests
Examination of Sputum - Routine and Specialtests
Semen examination - Routine and Specialtests
Examination of CSF - Routine and Specialtests
Examination of various body fluids-Pleural Fluid, Pericardial Fluid,Synovial Fluid, AsceticFluid
Various methods of detecting HCGlevels
Structure and molecular organization ofChromosomes
Identification of humanchromosomes
Karyotyping
Direct chromosome preparation of Bone Marrowcells
Culturetechniques
Bandingtechniques
Sex Chromatinbodies
Autoradiography of humanchromosomes
Chromosome Identification by image analysis and Quantitativecytochemistry
Clinical Manifestations of chromosomedisorders
Organization of HistologyLaboratory

PAPER:- 4 CLINICAL MICROBIOLOGY
UNIT I
UNIT I- GENERAL MICROBIOLOGY

History and Pioneers in microbiology
Microscopy
Morphology of bacteria and other microorganism
Nomenclature and classification of microbes
Growth and nutrition of bacteria
Sterilization and disinfection
Bacterial toxins
Bacterial genetics
Antibacterial substances used in the treatment of infection and drug resistance in bacteria
Bacterial ecology-Normal flora of human body, Hospital environment, Air, Water and Milk

UNIT II IMMUNOLOGY
GENERAL MICROBIOLOGY

Normal immunesystem
Innate immunity and acquiredimmunity
Antigens
Immunoglobulin
Complement
Antigen-Antibodyreactions
Cell mediated immunity & humoralimmunity
Hypersensitivity
Immunodeficiency
Auto-immunity

UNIT III
SYSTEMIC BACTERIOLOGY

Isolation, description and identification ofbacteria
Staphylococcus andMicrococcus
Streptococcus
Neisseria
Corynebacterium
Bacillus:The Aerobic spore bearingbacilli
Clostridium: The anaerobic spore bearingbacilli
Enterobacteriaceae
Vibrios andCampylobacter
Haemophilus andBordetella
Brucella
Mycobacteria
Actinomyces andNocardia
Pseudomonas
Spirochaetes
Chlamydiae
Rickettsiae
Mycoplasma &Ureaplasma

UNIT IV
VIROLOGY

Classifiacation ofviruses
Morphology, Virusstructure
Viralreplication
Pathogenicity ofviruses
Bacteriophages
Poxviruses
Herpesviruses
Arboviruses
Orthomyxxovirus
paramyxoviruses
Enteroviruses: Polio &other entericviruses
Hepatitisviruses
Rabiesviruses
Human immunodeficiencyviruses

UNIT V

PARASITOLOGY

Protozoan parasites of medicalimportance
Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Pneumocystis Carinii
Helminths: AllthosemedicallyimportanthelminthsbelongingtoCestodes,Trematodesand Nematodes
Cestodes: Diphyllobothrium, Taenia, Echinnococcus, Hymenolepis,
Nematodes: Trichuris, Trichinella, Strongyloides, Ancylostoma, Ascaris, Enterobius, Filarial worms, Dracunculus medinensis, etc.

UNIT VI
MYCOLOGY

The morphology and reproduction infungi
Classification offungi
Opportinisticfungi
Superficial mycoticinfections
Fungi causing subcutaneousmycoses
Fungi causing systemicinfections
Laboratory diagnosis of fungalinfections

UNIT VII
CLINICAL MICRO BIOLOGY

Laboratory diagnosis of Meningitis, Lower respiratory tract infection, Upper respiratory infection, Genital tractinfection.
Gastroenteritis
Blood streaminfection
Hospital acquired infection and Biomedical wastemanagement

Practical

SKILLS TO ACQUIRE BACTERIOLOGY

Aseptic practice in Lab and safetyprecautions
Washing and Sterilization ofglasswares
Care and operation of microscopes viz. Dark ground, Phase contrast and Fluorescent microscope,(Electronmicroscope.
Operation and maintenance of Autoclave, Hot air oven, Distillation plants, Filters like Sietz and Membrane and sterility test and Testing of disinfectant-Phenol coefficient test and its uses.
Care and maintenance of common laboratoryequipments
Collection of specimens for Microbiologicalinvestigations
Preparations of stains viz. Grams, Alberts, Capsules, Spores, Ziehl Neelsons,etc and performing ofstaining
Preparation and pouring of media- Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Kligler iron agar, Robertson's cooked meat, Lowenstein Jensen,Sabouraud's
Preparation of reagents-Oxidase, Kovac,etc
Identificationofbacteriaofmedicalimportanceuptospecieslevel(exceptAnaerobeswhich could beupto genericlevel)
Preparation of antibiotics discs: performance of Kirby Bauer, Stokes,etc
Disposal of contaminatedmaterials
Quality control of media, reagents,etc.
Techniques forAnaerobiosi

IMMUNOLOGY

Collection and preservation ofserum.
Performance of common serologicaltest
Immunoelectrophoresis
ELISA
CD4
Skin test - Montouxtest

MYCOLOGY

Collection and processing of clinical specimens forfungi.
Special techniques like Wood lamp examination, hair baiting techniques, slidecultures.
Stoke culturesmaintenance
PARASITOLOGY
Examination of faeces for ova and cysts: Direct and Concentrationmethod.
Egg countingtechniques.
Examination of peripheral blood, Urine, CSF, and other fluids forparasites.
Permanent staining technique forparasites.

VIROLOGY

Preparation and identification of CPE in various tissuecultures.
Serological test for viralinfections
Handling of experiment animals and collection of various samples for evidence of viral infections inanimals.
Laboratory diagnosis ofAIDS
Laboratory diagnosis ofHepatitis
Laboratory diagnosis ofDengue
Safetymeasures

1ST. YEAR (Semester- II)

PAPER:-5 PHYSIOLOGY & NUTRITION

Unit-I

Digestion and absorption of carbohydrates, proteins, fats and nucleic acids. Physiology and biochemistry of respiration. Detoxification mechanisms generally taking place in human body. Body fluids.

Unit-II

Blood clotting, extrinsic and intrinsic pathways. Anticoagulants. Clot refracts. Acid base balance. Muscle contraction and relaxation sliding filament theory. Biochemical changes taking place after death of the animal.

Unit-III

Sources, functions and importance of macro and micro minerals. Balanced diets. Nutritional disorder namely obesity, ketosis, starvations, malnutrition and deficiency diseases.

Unit-IV

Specific dynamic effect, BMR, BMI and energy intake. Major in born errors of protein, fat and carbohydrate metabolism. Intrinsic disorders of red cells hemoglobin and porphyrins.

Unit-V

Gout and genetic defects in urate metabolism. Methods employed usually in protein quality evaluation. Nutritional experiments commonly done on laboratory animals. Recent advance techniques used in human nutrition studies.
Practical Physiology & Nutrition

Bleeding disorders – PT, APTT, TT,Fibrinogen
Estimation of Calcium , Phosphorus, Magnesium, Manganese, Sodium ,Potassium,
Chloride, Iron , Copper, Iodine, Zinc, Protein hboundiodine
Agglutination reaction, Precipitation reaction, Immunodiffusion, Doublediffusion
technique, Immuno electrophoresis, Immunofixation, Migration inhibition factor,ELISA,
Nephelometric immunoassays, Chemiluminesence immunoassays,Immunofluorescence,
Western blotting and identification of blot by ELISAtechnique.
Preparation of antisera and itsstandardization.

PAPER :- 6 BIOSTATISTICS & HOSPITAL MANAGEMENT

Unit-I

Bio-statistics

Introduction and some basic concepts, Sample and Population, Collection, classification and presentation of data, Measures of Central Tendency (Mean, Median, Mode), Measures of Dispersion— Average Deviation, Standard deviation, Binomial, poison and Normal Distribution, skewness and kurtosis, Tests of

significance, Correlation, Regression, χ^2 test, t andp test.

Statistical definitions. Random sampling. Testing of hypothesis. Statistical tools for collection, presentation and analysis of data relating to causes and incidence o diseases. Measures of variation. Frequency distribution.

Unit-II

Concept of probability. Laws of probability. Probability distribution. Binomial, normal and chi-square distribution commonly used procedures of test of significance and estimation. Correlation and regression. Test of significance namely Z test, T test, Chi square test, F test. Analysis of variance.

Unit-III

Research statistics pertaining to medical laboratory technology and testing the efficacy of manufacturing drugs medicines and injections or curbing and controlling specific diseases. Statistical analysis of instrumental data and comparison of various biological techniques used inhospitals.

Types ofResearch:

Basic orfundamental
Applied
ClinicalExperimental

Qualification in ResearchMethodology

Open trials – Bias and safeguards againstit.
Double blind, Triple blindstudies Cross overmethods

Objectivity in ResearchMethodology

Instrumental quantification, rationales andfallacies
Reproducibility
Scoring methods – Safeguards against subjective bias. Records, Protocols andanalysis

Special areas ofresearch

Clinical
Experimental
Histological &morphological
Histochemical
Genetic
Epidemiologicstudies

Unit-IV

Health care – an overview. Functions of hospital administration, Modern techniques in hospital management. Challenges and strategies of hospital management. Administrative functions – planning, organizing, staffing, leading and controlling organizational structure, motivation and leadership. Designing health care organization.

Unit-V

Medical record. House-keeping services. Laboratory performance. Management of biomedical waste. Total patient care – indoor and outdoor. Nursing and ambulance resources. Evaluation of hospital. services Quality assurance. Record reviews and medical audit.

Recommended Books :

Methods in Bio-Statistics for medical students, Mahajan, B.K., Jaypee Brothers Medical Publishers, New Delhi.

PAPER:- 7 CLINICAL HEMATOLOGY

Red Blood Cells:

Normal morphologycount
Isolation from whole blood &count
Effect on count & morphology of physiochemical parameters & the diseasedstate
Red cell anomalies & their relevance w.r.t. normal & diseasedstate

Blood Transfusion:

Pre-requisitement& the complication of mis-matchedtransfusion.
Methods of bloodmatching

White blood cells &platelets;-

Morphology count & methods ofisolation
Effect on count & morphology of cell by the physiochemical parameters, diseased. State & the relevance of condition of thediseases

Anaemia's:

Definition (in general) &courses
Types of anemia & theirclassification
Physiochemical, characteristic features &eterology of a plastic anemia, hemolytic, megaloblastic
Clinical features &diagnosis

Leukaemia

Definition (in general) & heiretrology
Classification ofleukaemia
FABclassification
Etiologies, physiochemical features of different type o leukaeia,s with reference to clinical states
Diagnosis of different types ofleukaemias

Coagulationstudies;

General pathway (intrinsic &extrinsic)
Properties (physiochemical) mode of action of coagulationfactors
Plateletstudies,plateletfunctiontests(fordifferentCoagulationfactors)>Effectof promoters &inhibitors at

diff steps in coagulation, their solution & mode ofaction.
Diseases associated with coagulation disorders, their etrology& characteristicsfeatures.

Red Cell massstudies'
Chemical method & radioactivemethods
Red Cell functionstudies

Anaemia and other disorders ofErythropoiesis
Disorders ofLeucopoiesis
Haemostasis& itsinvestigations
Investigations of Thrombotictendency
Laboratory control of Anticoagulant , Thrombotic and platelettherapy
Collection and handling ofBlood
All Routine and special HaematologicalInvestigations
Blood and Bone Marrowpreparations
Leucoproliferative disorders with special references toLeukaemias
Automation inHaemtology
Cytochemistry of Leukaemiccells
Amniocentesis
Bone marrowtransplantation
Application of differentMicroscopes
Preparations of various Reagents and Stains used inHaematology
Immunophenotyping
Flowcytometry
Molecular techniques inHaematology

Practical- Clinical Hematology

Haemopoiesis
Anaemia and other disorders ofErythropoiesis
Disorders ofLeucopoiesis
Haemostasis& itsinvestigations
Investigations of Thrombotictendency
Laboratory control of Anticoagulant , Thrombotic and platelettherapy
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Application of differentMicroscopes
Preparations of various Reagents and Stains used inHaematology
Immunophenotyping
Flowcytometry
Molecular techniques inHaematology

Paper:- 8 ADVANCE INSTRUMENTATION &MAINTENANCE

Unit-I
Spectroscopy: Interaction of radiation wit matter, emission of radiation. Bear-Lambert relationship, components of a spectrophotometer. UV and vis spectrophotometer. Fluor metric methods, atomic absorption spectroscopy. Application of different spectroscopic techniques.

Unit-II
Principles of adsorption and partition chromatography. Absorption chromatography, liquid chromatography, Gas liquid chromatography, Ion exchange chromatography, Affinity chromatography and high pressure liquid chromatography. Application of chromatographic techniques in biology.

Unit-III
Dialysis, electrophoresis, immune electrophoresis, isoelectric focusing, isotachophoresis, capillary electrophoresis. Application of electrophoresis in biology. Blot techniques – southern and northern techniques.

Unit-IV
Centrifugation Preparative and analytical centrifuge, sedimentation analysis. Zonal and equilibrium density gradient. Ultracentrifuge. Light, phase contract, fluorescene and electron microscopy. Flame photometry. Analyzers.

Unit-V
Radioisotopes, nature of radioactivity, type of radioactivity, radioactive decay. Units of radioactivity. Detection and measurement of radioactivity. Knowledge of proportional scintillation and gamma counters. Autoradiography. Biochemical uses of radio isotopes.

Unit VI INSTRUMENTATION

Separation of DNA by Agarose GelElectrophoresis
Separation of isoenzymes, lipoproteins byPAGE
Separation of amino acids by paperchromatography
Separation of amino acids & or carbohydrates byTLC
Determination of effect of inhibitor on Km & Vmaxvalues
Estimation of proteins by Bradford`smethod
estimation of proteins by Folin-Lowry'smethod
Scanning of absorption spectra of color formed in biochemical assay on single beamspectrophotometer.

Practical
Estimation of biochemistry parameter using Autoanilizer,Semiautoanalyzer
Scanning of absorption spectra of any amino acid on double beamspectrophotometer
determination of Na+ & K+ in blood serum using flamephotometer
Determination of pH of blood and arterial blood gasanalysis.
Estimation of various minerals using Atomic absorption spectrophotometer(AAS).
Estimation of various hormones, tumor markers by using Chemiluminescence (CLIA) AND ELISAmethod.

Recommended Books:

Biologist, S Guide to Principles and Techniques of Practical Biochemistry, K. Wilson and K.H. Goulding, ELBSedition.
Principles and Techniques of Biochemistry and Molecular Biology, K. Wilson and J. Walker, Cambridge University Press,Cambridge.
Introductory Practical Biochemistry, Sawhney, S.K. Singh, R. Narosa Publishing House, NewDelhi.

2ND YEAR (Semester- III)

PAPER :- 1 LAB MANAGEMENT

Unit I
Pathological clinics
Ethics of the pathological clinics

Unit II
Pathology laboratory,
Organization to a pathology laboratory under board of quality control.

Unit III Development
Personality development and patient relationship.

Unit IV Reportswriting
Pathology reportswriting

Unit V: Computer application
Computer application in pathological clinics.

Unit VI : Accountancy
Accountancy in clinical pathology

Unit VIII Operation ethics
Introduction Operation ethics

Unit IX : Socialethics
Introduction techniques Social ethics of pathology

Unit X: Instruments
Proper handling to instruments

Unit XI: Administration of Laborites

Unit XII: Operation Hazardous compound

Chemical solvent poisons isotopes, explosives and Biological strains Pathological clinics
E Ethics of the pathological clinics

Organization of a pathology laboratory under board of quality control Personality development and patient relationship
Pathology reports writing
Computer application in pathological clinics Accountancy in clinical pathology
Hospital Management Operation ethics
Social ethics of pathology Proper handling of instruments

Laboratory management and use of computer in laboratory.
Laboratory safety, Personal management, Record keeping, Data analysis. Applications of computer in laboratory. Workload analysis
Finance: Budgeting, operational expenses, cost accounting, justification of budget. Principles, Application and maintenance of Auto analyzers, Blood gas analyzers, Electrolyte analyzer, Chemiluminescence.

Reference Book
Clinical Lab Management by Williams &Wilkins

PAPER :-2 Blood Transfusions & IMMUNOHEMATOLOGY

Unit I Reception, labeling and recording of laboratory investigations Cleaning of glassware, pipettes, E.S.R. tubes and counting chambers Preparation of capillary pipette, distilled water, reagents, buffers

Unit II Collection of blood, preparation of blood smear, staining of blood and bone marrow smears.

Unit III Measurement of hemoglobin, counting of leucocytes, erythrocytes, platelets and reticulocytes. Recognition of blood cells in peripheral blood smears

Unit IV Determination of haematocrite and E.S.R., preparation of haemolysate and determination of alkali resistant hemoglobin, paper electrophoresis of hemoglobin.
Test for sickle celling, bleeding time, coagulation time, prothrombin time, and kaolin cephalin clotting time.

Unit V Abo blood grouping and Rh typing
Performance of direct and indirect coombs test, red cell agglutination test (screening Paul bunnel test).

Unit VI Preparation for the demonstration of L.E. Cell phenomenon.

Unit VII Blood donor selection & screening
Blood collection and preservation, principal of clearing and preparing transfusion bottle and tubing sets – preparation and composition of anticoagulant – preservative solutions.

Unit VIII Transfusion reaction and their investigations

Immunohematology
Blood & blood group antigens: General characteristics of ABO, Lewis, Rh, Mn&Xgantigens. Leucocyte & platelet & is antigens. Blood transfusion, Erythroblast sisfetails.
Molecular structure of hemoglobin. Genetic significance ofHemoglobin,structuralvariation
Chemical & biochemical characteristics of Hemoglobin biosynthesis.

BloodGrouping
Introduction
Human Blood Groupsystem
ABOSubgroups
Red CellAntigen
NaturalAntibodies
Rh.System
Rh. Antigens & RhAntibodies
Hemolytic Diseases of New born &Prevention
Principal of Blood grouping, antigen-antibodyreaction.
Agglutination, Haemagglutination, Condition required for antigen antibodyreaction
Blood grouping techniques-Cell grouping, Serumgrouping
Method for ABO grouping Slid & Tube Method Cell grouping Serum grouping Rh grouping by slide & tubemethod
Difficulties in ABOgrouping
Rouleaux formation how it interfere with Bloodgrouping
Auto agglutinins.
Antiserum used in ABO test procedures, Anti-A, Anti-B, Anti-ABAntiserum
Inheritance of the Bloodgroups;
Control A & B Cells preparation AutoControl
Medical applications of Bloodgroups

BloodTransfusion
Principal & Practice of bloodTransfusion
Blood Transfusion service at DistrictLevel
Guide lines for the use of Blood Appropriate use of Blood QualityAssurance
Antilogous Blood Transfusionpractices.
Objectives of Quality Assurance in Blood Transfusion services, Standard operating procedures for usage, donation & storage of blood screening of donor compatibility testing, safety procurement of supplies.

BloodDonation
Introduction
Blood donorrequirements
Criteria for selection &rejection
Medical history & personaldetails
Self-exclusion
Health checks before donatingblood
Screening forTTI

BloodCollection
Blood collectionspacks
Anticoagulants

Taking & giving sets in Bloodtransfusion
Techniques of collecting blood from adoctor
Instructions given to the donor after blooddonation
Adverse donorreaction
Testing DonorBlood
Screening donor's blood for infectious agents –HIV,HCV,HBV, Trepanomapalladium, PlasmodiumHTLV.
Terially contaminatedBlood

Blood DonorRecords
Blood donation recordbook
Recordingresults.
Blood donorcard

Storage &Transport
Storage ofblood
Changes in blood afterstorage
Gasrefrigerator
Lay out of a blood bank refrefrigerator
Transportation

Maintenance of Blood BankRecords
Blood bank temperaturesheet
Blood bank stocksheet
Blood transfusion requestform.

CompatibilityTesting
Purpose
Single tube compatibility techniques using AHGreagent
Emergency compatibilitytesting
Difficulties in crossmatching
Labeling & Issuing cross-matchedblood

BloodComponents
Collection of blood components of fractionaltransfusion
Platelets packed Red Cell Platelet rich Plasma, Plateletsconcentrate
Preparation of concentrated (packed) RedCells
Techniques ofpreparation.

Blood TransfusionReaction
Investigation of a Transfusionreaction
Hemolytic transfusionreaction
Actions to take when transfusion reactionoccurs.

Practical Blood Transfusion
Blood BankAdministration
RecordKeeping
Computerization in blood transfusionservices.
Blood groupingABO
PH typing varioustechniques.
CrossMatching

Tubetest
SlideTest
DUTest
Sub GroupingTest

Coomb'sTest
Direct comb'stest
Indirect comb'stest

Compatibility testing for blood transfusion cross matchingtest.
5% cell suspension and 10% cellsuspensions.
HIV and AIDSdemonstration
Haemopoiesis
Anaemia and other disorders ofErythropoiesis
Disorders ofLeucopoiesis
Haemostasis& itsinvestigations
Investigations of Thrombotictendency
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Bone marrowtransplantation
Application of differentMicroscopes
Preparations of various Reagents and Stains used inHaematology
Immunophenotyping
Flowcytometry
Molecular techniques inHaematology

PRACTICAL

Basic Hematological Techniques, Characteristic of good technician, Preparation of specimen collectionmaterial,Lab.Requestfrom,Basicstepsfordrawingabloodspecimenbyveinpuncture. Complication of vein puncture, Patient after care, Specimen rejection criteria for blood specimen, Hemolytic of blood, Blood collection by skin puncture (Capillary Blood), Arterial puncture, Deciding specimen types and selection of , Anticoagulant-EDTA, Citrate, Oxalate, Heparin, sodium fluoride., Separation of serum, Separation of plasma, Changes in blood on keeping, Maintenance of specimen identification, Transport of the specimen, Effect of storage on Blood Cell Morphology, Universalprecautions.
24 Basic requirements for hematologylaboratory
Glassware's forHematology
Equipment's forHematology
Anticoagulant vialpreparation
Complete Blood Counts
Determination ofHemoglobin
TRBC Count byHemocytometers
TLC byHemocytometer

Differential Leukocytecount
Determination of PlateletCount.
Determination of ESR by winrobes
Determination of ESR by Wintergreen'sMethod
Determination of PCV byWintrobes
Erythrocyte Indices-MCV, MCHMCHC
ReticulocyteCount
Absolute EosinophilCount
Morphology of Red BloodCells
Blood grouping & CrossMatching
Reservesgrouping
Antigloubintest
Rh.Typing
Donor Blood ConnectionTechniques

Laboratory in Good Criteria for Save Blood Collection, Quality control in Blood Banks. Risk assessment for AIDS and Serum hepatitis.
Basic knowledge of disease transmissible disease example HIV, Sera rum hepatitis B and C, VDRL, andMalariya

Paper:- 3. Histopathology

Introduction to Histology, the cell, cell Organelles, nucleus, cell division, tissues, fresh & fixed tissues. Different types of Embedding Viz. Wax, Resin, and Cryostat etc. Basic Cytology

Theory of Histopathology Reception of specimens, Histopathology of Tumor cell, Histopathology of Liver Kidney Adrenal Ovary Testis.

Fixation of tissue, different kind of fixatives, sample fixative, compound fixative, formaldehyde, mercuric chloride, osmium, Picric acid, alcohols, other acids, formalin, buffered formalin, osmic acid, zenleersoln, he; ly'ssoln, cytological fixatives, nuclear fixatives, fixation of smear etc., decalcification, method of decalcification, assessment of decalcification, soln fordecalcification.

Processing of tissue, dehydration, impregnation in the wax, manual and automatic tissue processor, gelatin embedding, celloidin embedding, double embedding, cytological fixatives, preparation of different smears, vaginal, sputum, membrane.

Microtome, instrument, principle, use in section cutting, parts and working of commonly used microtome, different kinds of microtome, rotary, base sledge, sliding, law temperature microtome, cryostat, microtome knives, homing and stropping knives.

Section cutting o paraffin sections, section preparation from frozen sections, fixing of tissue to slide, preparation of celloidin section and fixation. Staining techniques, natural dyes, synthetic dyes, basic and acidic dyes, haematoxylin staining, Pap, flicker & Conn, methanamine silver nitrate, ziehlneelsen's stain, propylene glycol sudan technique, papanicolaou, harn's alum, Haematoxylin, acridine orange technique.

Unit I: 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 and identification Nucleic

acids DNA and RNA special stains and procedures
Cytoplasm constituents and their demonstration.

Cervical cytology basis of detection of malignant and premalignant lesions Hermoral assessment with cytologic techniques and sex chroatis and pregnancy tests Cells and organs of immunesystem.

Immunoglobulin's antibodies and humoral immune response Allergy
Rheumatological diseases and investigations.

Unit II Method of preparing stains

Method of preparing stains & Fixatives. Theory of Tissue processing and embedding, Theory of H & E staining.

Unit III Use Microtome Tissues section

Introduction, cutting Embedding and preparation of blocks Fixation of Tissue with DPX mount Theory of frozen section preparation.

Unit IV Preparation of smear

Preparation of smear for Fine needle aspiration cytology Pap's smear theory and identification of cells in a normal vaginal smear.

Unit V Stool examination

Normal abnormal constituent. Normal and abnormal constituent of Urine, Normal and abnormal constituent of amniotic fluid Normal and abnormal constituent of Semem analysis.

Equipment used in histopathology, their merits and demerits and care to be taken:
Tissueprocessor
Microtome
Knifesharpener
Automatic slidestrainer
Knives
Freezing microtome cryostat
Hotplate
Waterbath

Decalfication-method, advantage and disadvantage of eachmethod.
Frozen section and Cryostat techniques, staining and mounting technique morbidanatomy
Tissue processing-fixation Dehydrate, clearing impregnation in paraffin. Making of paraffin block and section cutting errors in section cutting and therecorrection.
Preparation of different types special stains. Histo-chemical and Cyto-chemical techniques Immune Cytochemicalstaining.

Practical

Organisation of HistologyLaboratory
Histologicalequipments
Reception and recording of tissuespecimen
Tissue processing and Microtomy includingfrozen
Theory ofstaining
Preparation and quality control of all routine and special stains used inistopathology

All staining techniques and theirinterpretation
Immunohistochemistry
Molecular markers of malignantneoplasms
Moleculartechniques
Immunofluorescenttechniques
Enzymehistochemistry
Museumtechniques
AutopsyTechniques
Automation in HistologicalTechniques
Histopathology, Reception of specimens, Histopathology of Tumorcell
Histopathology of Liver, Kidney, Adrenal, Ovary,Testies
Method of preparing stains &Fixatives.
Use of Microtome, Tissue sectioncutting
Embedding and preparation ofblocks
Fixation of Tissue with DPXmount
Reception and recording of tissuespecimen
Tissue processing and Microtomy includingfrozen
Theory ofstaining
Preparation and quality control of all routine and special stains usedinHistopathology
All staining techniques and theirinterpretation
Immunohistochemistry
Molecular markers of malignantneoplasms
Moleculartechniques
Immunofluorescenttechniques
Enzymehistochemistry
Museumtechniques
AutopsyTechniques
Automation in HistologicalTechniques

Paper :-4. Diagnostics Microbiology

Diagnostic Bacteriology

Epidemiology of bacterial infections, Guidelines for the collection, Transport, Processing analysis, isolation of bacterial pathogens and reporting of cultures from specimens for bacterial infections.
Bacterial infections of respiratory tract.
Bacterial infections of gastro intestinal tract and food poisoning. Bacterial urinary tract infections.
Bacterial infections of genital tract and reproductive organs. Bacterial infections of central nervous system.
Skin and soft tissue infections. Bone and joint infections
Eye ear and sinus infections Cardiovascular infections Tissue samples for culture Anaerobic infections Zoonotic infections.
Infections associated with immunodeficiency and immune suppression Pyrexia of unknown origin.

Bacterial immuno serology
Enteric fever Streptococal infections Syphilis
Rickettsial infections B rucellosis
Primary atypical pneumonia
New rapid serological diagnostic methods for bacterial infections.

Antibiotics in laboratory Medicine Antibiotics and mechanism of action MIC&MBC

Invitro susceptibility tests-Different methods Rapid methods of antibiotic susceptibility tests Antibiotic resistance mechanisms
Detection of methicillin resistant staphylococci

Diagnostic parasitoloy
Systematic study of following parasites (Geographical distribution, habitat, morphology and life cycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Protozoa – Intestinal amoeba, free living pathologic amoeba, giardia, trichomonas, balantidium, isospora, cryptosporidium, microspora,cyclospora Plasmodia, leishmania, trypanasoma, toxoplasma, babesia.

Helminthes –
Cestodes – Taenia, Echinococus, Diphylobothrium,Hymenolepsis,Multiceps Trematodes- Schistosoma, Fasciola, Fasciolepsis, Paragonimus,Clonorchis,Opisthorchis.
Nematodes- Ascaris, Hookworm, Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus
Biological vectors

Mycology
General Mycology – Fungus – Classification
Fungal Structure & Morphology, Reproduction in fungi, Immunity to Fungal Infections. Culture Media in Mycology , Stains in Mycology.
Normal fungal flora of human beings

Diagnostic Mycology
Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections.
Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification
Anti fungal agents, invitro tests. Serological tests for mycotic infections. Use of laboratory animals in Mycology.

Practical
Diagnostic Microbiology
Isolation, Characterization and identification of pathogens from variousclinical specimens.
Study of antibiotic sensitivity of commonpathogens
Common serological tests for the diagnosis of bacterialinfections.
Collection & transport ofspecimens
Examination of stool forparasites.
Examination of blood & bone marrow forparasites.
Examination of other body fluids & biopsy specimens forparasites.
Culture techniques forparasites.
Serological diagnostic methods , skintest
Collection & transport ofspecimens
Examination of stool forparasites.
Examination of blood & bone marrow forparasites.
Examination of other body fluids & biopsy specimens forparasites.
Culture techniques forparasites.
Serological diagnostic methods , skintests.

Diagnostic Mycology

Epidemiology, Pathogenesis, Laboratory Diagnosis of FungalInfections.
Specimen collection, preservation, Transportation & Identification of MycologicalAgent.
Biochemical tests for fungalidentification
Anti fungal agents, invitrotests.
Serological tests for mycoticinfections.
Use of laboratory animals inMycology.
Typing offungi
Preparation of fungal antigens & their31tandardization
Media & Stains preparation for Mycology, Diagnostic Methods in MycoticInfections, Identification test in Mycology, Serological tests in Mycology Skintests.
Animal inoculationtechniques

Paper 5: Corporate Communication

Unit 1: Introduction to Business Communication
Unit 2: Delivering Your Message
Unit 3: Understanding Your Audience
Unit 4: Effective Business Writing
Unit 5: Developing and Delivering Effective Presentations
Unit 6: Negative News and Crisis Communication
Unit 7: Intrapersonal and Interpersonal Communication
Unit 8: Intercultural and International Communication
Unit 9: Group Communication, Teamwork, and Leadership

2ND YEAR (Sem IV)

Paper :- 5 Basic Cellular Pathology & Allied Technology

Unit I Study of body tissues:-Epithelial tissues connective tissue including bone and cartilage muscular tissue

Unit II Study of various system:-Circulatory system, alimentary system, digestive system including liver, pancreas and gall bladder, Respiratory system

Unit III 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 micrometry

Unit IV Metachromasis and Met achromatic dyes Haematoxylin stain, its importance in histology

Unit V Stains cytological preparation with special emphasis on MGG, APANTICOLOU stains

Unit VI Special stains like PAS, Mucicarmine, Alcain blue, Schmorl, Acid phosphatase

Unit VII Study of body tissues-Nervous tissue glands epithelial and endocrine.

Unit VIII Study of body tissues-Nervous tissue glands epithelial and endocrine.

Unit IX Study of various systems-urinary systems system of endocrine glands reproductive system, nerve endings and organs of special senses.

Unit X Carbohydrates and amyloid-special staisn and procedures.

Unit XI Connective tissues, trichrome staining and other special stains for muscle fibbers elastic and reticule fibbers and collages fibers.

Unit XII Principles of metal impregnation technique. Demonstration and identification of mineral and pigments.Cytological screening and quality control in cytology laboratory.

No practical examination

Paper:- 6 HEMATOLOGY & CLINICAL PATHOLOGY

Red Blood Cells :
Normal morphologycount
Isolation from whole blood &count
Effect on count &morphology of physiochemical parameters & the diseasedstateRed cell anomalies & their relevance w.r.t normal & diseased state

Blood Transfusion:

Pre-requisitement& the complication of mis-matchedtransfusion
Methods of bloodmatching

White blood cells &platelets;-
Morphology count & methods ofisolation
Effect on count &morophology of cell by the physiochemical parameters , diseased . State & the relevance of condition of thediseases

Anaemia's:
Definaation(in general) &courses
Types of anaemia& theirclassification
Physiochemical , characteristic features &eterology of a plasticanaemia, haemoloytic,megaloblastic
Clinical features & diagnosis

Leukaemia
Definition (in general)& theiretrology
Classification ofleukaemia
FABclassification
Etiologies ,physiochemical features of different Type of leukaeia,s with referenceto Clinicalstates
Diagnosis of different types of leukemia

Coagulation studies;
a. General pathways (intrinsic & extrinsic)
b. Properties (physiochemical) mode of action of coagulation factors
c. Platelet studies, platelet function tests (for different Coagulation factors) > Effect of promoters & inhibitors at diff steps in coagulation, their solution & mode of Action
d. Diseases associated with coagulation disorders, their etrology& characteristics Features.

Red Cell mass studies ;
Chemical method & radioactivemethods
Red Cell functionstudies

Haemopoiesis
Anaemia and other disorders ofErythropoiesis
Disorders ofLeucopoiesis
Haemostasis& itsinvestigations
Investigations of Thrombotictendency
Laboratory control of Anticoagulant , Thrombotic and plateletherapy
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Leucoproliferative disorders with special references toLeukaemias
Automation inHaemtology
Cytochemistry of Leukaemiccells
Amniocentesis
Bone marrowtransplantation
Application of differentMicroscopes
Preparations of various Reagents and Stains used inHaematology
Immunophenotyping
Flowcytometry

Molecular techniques inHaematology
Examination of Urine - Routine and Specialtests
Examination of Stool - Routine and Specialtests
Examination of Sputum - Routine and Specialtests
Semen examination - Routine and Specialtests
Examination of CSF - Routine and Specialtests
Examination of various body fluids-Pleural Fluid, Pericardial Fluid,Synovial uid, AsceticFluid
Various methods of detecting HCGlevels
Structure and molecular organization ofChromosomes
Identification of humanchromosomes
Karyotyping
Direct chromosome preparation of Bone Marrowcells
Culturetechniques
Bandingtechniques
Sex Chromatinbodies
Autoradiography of humanchromosomes
Chromosome Identification by image analysis and Quantitativecytochemistry
Clinical Manifestations of chromosomedisorders

Practical Hematology & Clinical Pathology

Haemopoiesis
Anaemia and other disorders ofErythropoiesis
Disorders ofLeucopoiesis
Haemostasis& itsinvestigations
Investigations of Thrombotictendency
Laboratory control of Anticoagulant , Thrombotic and platelettherapy
Collection and handling ofBlood
All Routine and special HaematologicalInvestigations
Blood and Bone Marrowpreparations
Leucoproliferative disorders with special references toLeukaemias
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Cytochemistry of Leukaemiccells
Amniocentesis
Bone marrowtransplantation
Application of differentMicroscopes
Preparations of various Reagents and Stains used inHaematology
Immunophenotyping
Flowcytometry
Molecular techniques inHaematology
Examination of Urine - Routine and Specialtests
Examination of Stool - Routine and Specialtests
Examination of Sputum - Routine and Specialtests
Semen examination - Routine and Specialtests
Examination of CSF - Routine and Specialtests
Examination of various body fluids-Pleural Fluid, Pericardial Fluid,Synovial Fluid, AsceticFluid
Various methods of detecting HCGlevels
Structure and molecular organization ofChromosomes
Identification of humanchromosomes

Karyotyping
Direct chromosome preparation of Bone Marrowcells
Culturetechniques
Bandingtechniques
Sex Chromatinbodies
Autoradiography of humanchromosomes
Chromosome Identification by image analysis and Quantitativecytochemistry
Clinical Manifestations of chromosomedisorders

Paper :-7 Anatomy &Histo Technology

Laboratory equipment its uses and maintenance Laboratory hazards and safety precautions

Anatomy and physiology of human body: General organization synopsis of all systems Cell organization and function: Structure & function of all cell organelles

Skeletal system: Structure and functions of all individual bones and joints movement of joints Skeletal muscles Cardiac muscles smooth muscles of upper arm & anterior compartment of thigh (their name attachment function and nerve supply)

Blood : Functions of blood, composition of blood plasma & its functions; Blood clotting (mechanism clotting factors) Morphology of red blood cells, their function and development Hemoglobin anemia; WBC classification development & functions; platelets: morphology & functions; Blood groups, blood transfusion and transfusion reactions.
Reception recording and labeling of histology specimens Fixation and various fixatives
Processing of histological tissues for paraffin embedding Embedding and embedding media

Decalcification various methods
Introduction to exfolative cytology with specialemphasisonfemale tract(PAP smear, cone biopsy)
Solvents mordents accelerators and accentuates
Microtome's various types their working principle and maintenance Microtome's Knives and Knife sharpening
Practical section cutting faults and remedies
Routine staining procedures mounting and mounting media Dye chemistry theory and practice ofstaining
Use of controls in various stainingprocedures
Collection processing and staining of cytological specimen
Tissue requiring special treatment i.e. eye ball Bone marrow biopsy under calcified bones.
Neuropathology techniques
Enzyme histochemistry demonstrations of phosphates dehydrogenises oxides and peroxides etc.
Electron microscope working principle components and allied techniques for electron microscopy ultra-microtome Museum techniques
Aspiration cytology principles indications and utility of the technique with special emphasis on role of cytotechnician in FNAC clinics
Infection and immune system Cancer Immunology
Tissue typing for kidney transplant

Practical Anatomy & History Technology

Practical: Demonstration of section of male and female pelves with organs insitu
Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes,ovary
Radiographs of pelvis –hysterosalpingogram
Histology of thin and thickskin
Demonstration and histology ofeyeball
Histology of cornea &retina
Organisation of HistologyLaboratory
Histologicalequipments
Reception and recording of tissuespecimen
Tissue processing and Microtomy includingfrozen
Theory ofstaining
Preparation and quality control of all routine and special stains usedin Histopathology
All staining techniques and theirinterpretation
Immunohistochemistry
Molecular markers of malignantneoplasms
Moleculartechniques
Immunofluorescenttechniques
Enzymehistochemistry
Museumtechniques
AutopsyTechniques
Automation in HistologicalTechniques

Paper:- 8 PATHOLOGY, TERMINOLOGY & CYTOLOGY

Unit I

Introductory Pathology: Cellular adaptation and cell death; inflammation and repair; infection; circulatory disorders; immune defense; genetics of disease; neoplasia. Cell injury and adaptation : Atrophy, hypertrophy, metaphase, hyperplasia, classification of tumors, premalignant lesion, Types of inflammation & system manifestations of inflammation Disorders of vascular flow & shock (Brief introduction) ; Oedema,hyperemia or congestion, thromboses, embolism, infarction shock, ischemia, Over hydration, Dehydration , The Response to infection ; Categories of infectious agents, host barriers to infection, how disease is caused , inflammatory response to infectious agentsHematopoietic and Lymphoid System : hemorrhage, various type of Anaemia, leucopenia, leucocytosis, bleeding disorders coagulation mechanism.

Unit II

Fundamentals of Medical Terminology :

Word Roots
Prefix
Suffix
Abbreviations &Symbols
Gastro intestinal
Chelecystitis
Cholelithiasis
Appendicitis
IntestinalObstruction
Hernia
Peritonitis
Gastro copy : Endoscopy, Laparotomy, laparoscopy . Common Diseases & Procedures
Respiratory
Tuberculosis
BronchialAsthma
RespiratoryFailure
PulmonaryEmbolison
Pneumonia

Bronchoscope, Pulmonary Function test, Cardio-Pulmonary Resuscitation.

Unit III

Circulatory Hypertension

Coronary Artery Disease Arrhythmias

Cardiac Arrest
Shock, Deep Vein thrombosis (DVT) , ECG,2D Echo Cardiogram, Coronary Angiography, Cardiac Catheterization, Stress test, Pacemaker.

Renal
Nephrotic Syndrome Urinary Tract Infection Renal /Bladder Stones
Intravenous Pylography,Cystoscopy,Urinalysis,Hoemodialis, Peritoneal Dialysis

Reproductive

Female - breast cancer /Self Examination
Menstrual Disorders, Dysmenorrheal, Premenstrual Syndrome (PMS) , Menorrhagia

Ovarian
Cyst, Fibrods, Malignancy, Infertility Mammography, Ultra Sound, Laparoscopy, IV F, Tubectomy,

D& C
Male - Prostate Enlargement, Hydrocele, Impotence, T transurethral Research of Prostate (TURA)

Nervous
Stroke (Cerebro Vascular Accident) Brain Tumor
Brain Injuries Spinal CordInjuries
Lumbar Puncture, Myelography, CT Scan, MRI, EEG, EMG

Oncology
Investigations, Tumor markers, RECIST Criteria for response evolution

Cytology
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 and identification Nucleic acids, DNA and RNA special stains and procedures
Cytoplasmic constituents and their demonstration.
Cervical cytology-basis ofdetection of maligrant and premalignant lesions.
Hermoral assessment with cytologic techniques and sex chromatis and pregnancy test. Cells and organs of immune system
Immunoglobulins, antibodies and humoral immune response Allergy
Rheumatologic diseases and investigations.

Tissues requiring special treatment i.e. eye ball Bone marrow biopsy under calcified bones.
Neuropathology techniques
Enzyme histochemistry demonstrations of phosphatases dehydrogenases oxidases and peroxidases etc.
Electron microscope working principles components and allied techniques for electron microscopy ultra-microtomy Museum techniques
Aspiration cytology principles indications and utility of the techniques with special emphasis on role of cytotechnician in FNAC clinics
Infection and immune system Caner Immunology
Tissue typing for kidney transplant

Practical cytology

Morphology and Physiology ofcell
Cytologyof
Female genitalTract
UrinaryTract
GastrointestinalTract
RespiratoryTract
Effusions
Miscellaneous Fluids

Collection,Preservation,Fixation and Processing of various CytologicalSpecimen
Preparation and Quality control of various stains and reagents used incytology
All routine and special Staining techniques incytology
FNAC
Immunocytochemistry
Flowcytometry
Automation inCytology

Dissertation

Eligibility to be aguide

Shall be a full time teacher in the college or institution he or she is working.

Viva- voce:-

ETHICS IN M. Voc. MLT PATHOLOGYTECHNOLOGY

Introduction: With the advances in science and technology and the increasing needs of the patient, their families and community, there is a concern for the health of the community as a whole. There is a shift to greater accountability to the society. It is therefore absolutely necessary for each and every one involved in the health care delivery to prepare them to deal with these problems. Technicians like the other professionals are confronted with many ethical problems.

Standards of professional conduct for technicians are necessary in the public interest to ensure an efficient laboratory service. Every technician should not only be willingly to play his part in giving such a service, but should also avoid any act or omission which would prejudice the giving of the services or impair confidence, in respect, for technician as a body.

To accomplish this and develop human values, it is desired that all the students undergo ethical sensitization by lectures or discussion on ethical issues.

Introduction to ethics-

What is ethics?

General introduction to Code of Laboratory Ethics

How to form a value system in one's personal and professional life? International code of ethics

Ethics of the individual- Technician relation to his job Technician in relation to his trade Technician in relation to medical profession Technician in relation to his profession.

Professional Ethics-
Code of conduct
Confidentiality
Fair trade practice
Handling of prescription
Mal practice andNegligence Professional vigilance

ResearchEthics-
Animal and experimental research/ humanness Human experimentation
Human volunteer research - informed consent Clinical trials
Gathering all scientific factors Gathering all value factors
Identifying areas of value – conflict, setting priorities
Working out criteria towards decision
ICMR/ CPCSEA/ INSA Guidelines for human / animal experimentation

Recommended reading

Francis C.M., Medical Ethics, I Edition, 1993, Jay pee Brothers, New Delhip189.
Good Clinical Practices: GOI Guidelines for clinical trials on Pharmaceutical Products in India(www.cdsco.nic.in)
INSA Guidelines for care and use of Animals in Research –2000.
CPCSEA Guidelines2001(www.cpcsea.org).
Ethical Guidelines for Biomedical Research on Human Subjects, 2000, ICMR, NewDelhi

ANNEXURE-I CATEGORIES OF BIO-MEDICAL WASTE

	Waste Category ** Type	**Treatment a Disposal ** Options**
Category No. 1	Human Anatomical Waste: (human tissues, organs, body parts)	Incineration deep burial
Category No. 2	Animal Waste: (animal tissues, organs, body parts, carcasses, blooding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge form hospitals, animal houses)	Incineration deep burial
Category No. 3	Microbiology & Biotechnology Waste: (wastes from laboratory cultures, stocks or specimens or micro-organisms live or attenuated vaccines, human and animal Cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	Local autoclaving / micro waving / incineration.
Category No. 4	Waste sharps: (Needles, syringes, scalpels, blades, glass, etc, that may cause puncture and cuts. This includes both used and unused sharps)	Disinfection (chemical treatment / autoclaving / micro –waving and mutilation / shredding
Category No. 5	Discarded Medicines and Cytotoxic drugs: (wastes comprising of outdated, contaminated and discarded medicines)	Incineration / destruction and drugs disposal in secured landfills.

Category No. 6	** Solid Waste: (Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, Eners, beddings, other material contaminated with blood)	Incineration Autoclaving / micro waving
Category No. 7	Solid Waste: (Wastes generated form disposable items other than the waste ** sharps such as tubings, catheters, intravenous sets, etc)	Disinfection by chemical treatment, autoclaving / micro-waving and mutilation / shredding
Category No. 8	Liquid Waste: (Waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities)	Disinfection by chemical treatment and discharge into drains
Category No. 9	Incineration Ash: (Ash from incineration of any biomedical waste)	Disposal in municipal landfill