



DIPLOMA IN MEDICAL LAB TECHNICIAN

(DMLT)

DURATION :3 YEARS (6 SEMESTER)

ELIGIBILITY : 10TH PASS

DMLT			
S.NO	PAPER CODE	NAME OF PAPERS	CREDIT
1ST SEMESTER			
1	101	HUMAN ANATOMY	4
2	102	HUMAN PHYSIOLOGY	4
3	103	BASIC HAEMATOLOGY AND CLINICAL PATHOLOGY	4
4	104	ENGLISH COMMUNICATION & SOFT SKILLS	3
5	105	PRACTICAL-I	3
2ND SEMESTER			
1	201	GENERAL MICROBIOLOGY	4
2	202	GENERAL BIOCHEMISTRY	4
3	203	COMPUTER FUNDAMENTALS	3
4	204	PRACTICAL-II	3
5	205	CLINICAL POSTING-I	2
3RD SEMESTER			
1	301	GENERAL PATHOLOGY	4
2	302	CLINICAL HAEMATOLOGY	4
3	303	CLINICAL BIOCHEMISTRY	4
4	304	ENVIRONMENTAL SCIENCE	2
5	305	PRACTICAL-III	3
4RTH SEMESTER			
1	401	IMMUNOLOGY & SEROLOGY	4
2	402	HISTOPATHOLOGY & HISTOTECHNIQUES	4
3	403	IMMUNOHEMATOLOGY & BLOOD BANKING	4
4	404	PRACTICAL -IV	3
5	405	CLINICAL POSTING-II	2
5 TH SEMESTER			
1	501	CLINICAL ENZYMOLOGY & AUTOMATION	4
2	502	MEDICAL MICROBIOLOGY	4
3	503	PARASITOLOGY	4
4	504	DIAGNOSTIC CYTOLOGY	3
5	505	PRACTICAL-V	3
6 TH SEMESTER			
1	601	CLINICAL ENDOCRINOLOGY & TOXICOLOGY	4
2	602	ADVANCE DIAGNOSTIC TECHNIQUES	4

3	603	CLINICAL VIROLOGY	4
4	604	PRACTICAL-VI	3
5	605	CLINICAL POSTING-III	2

CAS

101 HUMAN ANATOMY

Unit -1

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

Unit -II

Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division
Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle
Tissue, Nerve Tissue, Membranes, Glandular tissue
The Integumentary System: structure and function of The Skin, Subcutaneous Tissue

Unit-III

Musculoskeletal System: Basic anatomy of important muscles and bones

Unit-IV

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

Unit - V

Digestive system: basic anatomy of oesophagus, stomach, small intestine, large intestine, liver, gall
bladder, pancreas

102 HUMAN PHYSIOLOGY

Unit-I

Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization
of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis,
Tonicity, Homeostasis

Unit-II

Blood-composition, function, cellular component & their function, haemoglobin&anaemia, blood
groups and coagulation

Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of
thymus

Unit-III

Cardiovascular system-general arrange, heart, arteries, veins and capillaries, heart structure and
function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition
of hypertension & shock

Unit-IV

Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function,
pulmonary circulation, lungs volume, Gas transport between lungs and tissues,
Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases

Unit- V

Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion,
absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates,
proteins& lipids, Structure & function of liver, spleen, gall bladder & pancreas, Jaundice, Cirrhosis
& Pancreatitis

103 BASIC HAEMATOLOGY AND CLINICAL PATHOLOGY

Unit- I

Introduction to Haematology, Organization of laboratory and safety measures, Laboratory Safety guidelines, Biomedical waste management, BMW – Segregation, collection, transportation, treatment and disposal (including colour coding), Personal Protective Equipment, The Microscope and its parts, care and maintenance, monocular and binocular microscope, Corrective Actions in Light Microscopy, Important equipment used in haematology lab

Unit-II

Haematopoiesis, Erythropoiesis, Leucopoiesis, Thrombopoiesis, Mechanism of hemopoiesis, stages of cell development, sites of hemopoiesis, Blood and its composition, plasma and its composition, RBC, WBC, Platelets, Anticoagulants, mechanism of action, types and uses, merits and demerits, effect of storage on blood cells

Unit-III

Collection, Transport, Preservation, and Processing of various clinical Specimens, Blood collection for hematological investigations, Venipuncture, Capillary blood, Arterial blood, Vacutainer, its type and uses, sample acceptance and rejection criteria.

Unit-IV

Hemoglobin, structure, function and types, Hemoglobinometry, Haemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations on blood parameters

Hemocytometry, visual and electronic method, Neubauer counting chamber, RBC count, WBC count, Platelets count, absolute eosinophil count, principle, procedure, calculation, significance, precautions involved during counting, absolute count of various WBCs. Physiological and pathological changes in values

Unit-V

Preparation of thin and thick smears, staining of smears, Romanowsky dyes, preparation and staining procedures of blood smears, Morphology of normal blood cells and their identifications, differential leucocytes count by manual and automated method, physiological and pathological variations in value

104 ENGLISH COMMUNICATION & SOFT SKILLS

UNIT-I: Introduction to English language

- a) Role and significance of English language in the present scenario
- b) English Language: Its relevance for the Indian industry
- c) Introduction to Listening, Speaking, Reading, Writing (LSRW) and benchmarking of the class
[Note: As part of classroom activity, a guest lecture from an industry representative/Director (CRC) and maintaining progress card for each student on LSRW for future reference]

UNIT-II: Phonetics & Functional Grammar

- a) Pronunciation and daily usage correction (speak with differences between p/b, s/sh, f/ph, t/d, v/w sounds)
- b) Parts of speech, articles, tenses, verbs and modals
- c) Practice of daily use words, numerals and tongue twisters
- d) Vocabulary building, Construction of simple sentences: Basic sentence pattern, subject and Predicate

[Note: As part of classroom activity, language games, tongue & jaw exercises, simple passages from the newspapers for oral drills in the classroom and practice tests (written and oral)]

UNIT-III: English Communication- About Myself

- a) Let's talk, making conversation, meeting and greeting
- b) Introducing myself, my family and my friends
- c) My opinions, my likes and dislikes
- d) Life at college, hostel and workplace

[Note: As part of classroom activity, use the Workbook for reference for classroom and home

assignments, carry out practice tests (written and oral)]

UNIT-IV: Personality Development

- a) First impression: Dressing sense, good manners, speaking well and respectably
- b) Positive Attitude: Being happy and alert, a good listener and a good friend
- c) Consultation among peers: Soliciting advice and giving advice
- d) Goal setting, confidence building & handling rejection

[Note: As part of classroom activity, refer Workbook for classroom and home assignments, carry out practice tests (written and oral)]

105 PRACTICAL-I

Practical Human Anatomy

1. Demonstration of Major organs through models and permanent slides.
2. Demonstration of parts of circulatory system from models.
3. Demonstration of parts of respiratory system from models.
4. Demonstration of digestive system from models.
5. Demonstration of excretory system from models.
6. Demonstration of nervous system from models.
7. Structure of eye and ear
8. Demonstration of structural differences between skeletal, smooth and cardiac muscles.
9. Demonstration of various bones
10. Demonstration of various joints
11. Demonstration of various parts of male & female reproductive system from models

Practical Human Physiology

1. To measure pulse rate
2. To measure blood pressure
3. Demonstration of ECG
4. To perform Hemoglobin by Sahli's Method
5. To perform Hemoglobin by CMG method.
6. Haemoglobin by CMG method.
7. To perform Total RBC count.
8. To perform total leucocyte count.
9. To perform differential leucocyte count.
10. To perform PCV
11. To calculate Red cell indices.

Practical Basic Haematology & Clinical Pathology

1. To learn general laboratory safety rules.
2. To demonstrate glasswares, apparatus and plasticwares used in laboratory.
3. To prepare EDTA, Sod. Citrate & Sod. Fluoride anticoagulants and bulbs/vials used in laboratory.
4. Demonstration of Vacutainer.
5. To demonstrate method of blood collection.
6. To separate serum and plasma.
7. Demonstration of microscope
8. Determination of Hemoglobin by various methods.
9. Determination of TLC
10. Preparation of thick and thin smear
11. Determination of DLC
12. Determination of Total RBC
13. Determination of total platelet count
14. Determination of absolute leucocyte count

201 GENERAL MICROBIOLOGY

Unit-I

Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner

Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, ribosomes.

Unit-II

Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties micrometry. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

Unit-III

Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram-positive and Gram-negative cell walls, Cell Membrane: Structure, function and chemical composition of bacterial cell membranes. Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation

Unit-IV

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

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

Unit-V

Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants

Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. use and abuse of disinfectants. precautions while using the disinfectants.

202 GENERAL BIOCHEMISTRY

Unit-I

Introduction to Clinical Biochemistry and role of Medical Lab Technologist, ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents.

Glassware's & plastic ware's used in lab, calibration of volumetric apparatus, cleaning & care and maintenance

Unit II

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

Unit-III

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

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

Unit-IV

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample

Unit- V

Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs urine for protein and their clinical significance.

203 COMPUTER FUNDAMENTALS

Unit-I

Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit-II

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Unit-III

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Unit-IV

Introduction of Operating System: introduction, operating system concepts, types of operating system, Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Electronic Payment Systems: Introduction, Types of Electronic Payment Systems, Digital Token-Based, Electronic Payment Systems, Smart Card and Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk and Electronic Payment Systems.

Unit-V

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

204 PRACTICAL-II**Fundamentals of Microbiology**

1. Demonstration of Microscope and its parts
2. Demonstration of glassware used in microbiology.
3. Demonstration of autoclave and sterilization of glass wares.
4. Demonstration of Hot air oven and sterilization of glass wares.
5. To perform Gram staining
6. To perform Acid fast staining (ZiehlNeelsen staining)
7. To perform Indian ink staining
8. To perform Hanging drop method
9. Demonstration of capsule
10. Staining of bacterial spores
11. To demonstrate agglutination reaction.
12. To perform RA test
13. To perform WIDAL test
14. To perform RPR test.
15. To perform CRP test.

Practical Fundamentals of Biochemistry

1. To study general laboratory safety rules.
2. To demonstrate glasswares,apparatus and plasticwares used in laboratory.
3. Collection of blood sample
4. To separate serum and plasma.

5. Preparation of different percentage solutions
6. Preparation of normal and molar solutions.(0.1 N NaOH, 0.2N HCl,0.1 M H₂SO₄)
7. Demonstration of photocolormeter
8. Demonstration of spectrophotometer
9. Demonstration of pH meter
10. Deproteinization of blood sample

Practical: Basics of Computer

Computer fundamental and internet lab

1. Using basic DOS commands.
2. Using external DOS commands
3. Creating a email account
4. Using web browser for searching and surfing.
5. Creating and formatting a document in MS office
6. Using autocorrect, auto text and spell check operation in MS office .
7. Create tables in MS Word.
8. Inserting different kinds of object in MS word.
9. Use main merge options in MS office.
10. Create a Excel work sheet with following options rows and columns alignment..
11. Using excel formulas.
12. Create a graph with available data in MS excel.
13. Create a PPT presentation using auto content wizard.
14. Use Clip art animation effects and word art galleries in presentations.
15. Using transition and setting timings for slide show.
16. Use MS access to create data base and tables.

205 Hospital Posting:

Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centres to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.

301 GENERAL PATHOLOGY

Unit I

Introduction & History of pathology, Basic definitions and familiarization with the common terms used in pathology, Causes and mechanisms of cell injury, reversible and irreversible injury, Introduction of hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis

Unit II

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

Unit III

Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension.

Unit IV

Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Aetiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease

Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

Unit V

Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis,

Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.

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

302 CLINICAL HAEMATOLOGY

Unit -I

RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3-BPG and oxygen dissociation curve.

Anaemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management,

Iron deficiency anaemia, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test

Megaloblasticaemia, pernicious anaemia, pathogenesis, laboratory investigations

Unit-II

Haemoglobin, its synthesis and types, normal and abnormal hemoglobins, extravascular and intravascular hemolysis.

Haemolyticaemia, pathogenesis and laboratory investigations, principle and procedure of special test, G-6-PD

Unit -III

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

Unit-IV

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

Unit-V

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

303 CLINICAL BIOCHEMISTRY

Unit-I

Basics of Metabolism, metabolism of Carbohydrates, Glycolysis, bioenergetics, regulation of blood sugar, Introduction and significance of gluconeogenesis, glycogenesis, glycogenolysis, HMP Pathway, Role of G-6-PD.

Unit-II

Fate of Pyruvate, TCA cycle and its significance, Electron transport Chain

Diabetes, types, clinical features, diabetic profile test, HbA1C, GTT, Types of sugar, Hyperglycemia and Hypoglycemia, Ketone bodies, Introduction of carbohydrate metabolism

Unit-III

Digestion and Absorption of Proteins, Metabolism of Proteins , Formation of ammonia, Transamination, Deamination, Urea Cycle, Significance of Urea, Estimation of total protein, Albumin ,Globulin and A/G ratio, Aminoaciduria, 24 hrs of urinary proteins

Unit-IV

Digestion and absorption of fatty acids, Metabolism of fatty acids, Beta oxidation of fatty acids, Ketone bodies and ketosis,

Cholesterol, Plasma lipids, Lipoproteins, Lipid profile Test, Triglycerides, HDL, VLDL, LDL, Risk factors, Hyperlipidemia and Dyslipidemia

Unit-V

Principle, application, calibration and maintenance of photcolorimeter, spectrophotometer, Blood Chemistry analyzer, Flame photometer, Turbidimetry

304 ENVIRONMENTAL SCIENCE

Unit I

Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.

Ecology and Environment: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid & Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.

Unit II :Natural Resources: Renewable & Non-Renewable resources; Land resources and land use change; Land degradation, Soil erosion & desertification. **Deforestation:** Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources:** Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies.

Biodiversity: Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India

Unit III :Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies

Unit IV :Environmental policies & practices: Climate change & Global Warming (Green house Effect),Ozone Layer -Its Depletion and Control Measures, Photochemical Smog, Acid Rain
Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context

Unit V :Human Communities & Environment:
Human population growth;impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case studies.

305 PRACTICAL-III

Practical Haematology& Pathology

1. To perform ESR by Various methods.
2. To perform PCV
3. To determine red cell indices
4. To perform routine stool examination
5. To perform bleeding time
6. To perform clotting time
7. To perform blood grouping by slide method
8. To perform blood grouping by tube method
9. To demonstrate cell counter
10. To demonstrate coagulometer.

Practical Biochemistry

1. To identify carbohydrates in given solution by various methods.
2. To determine protein by Biuret method.
3. To perform protein test by various methods.
4. Physical examination of urine
5. Urine sugar determination by Benedict's metod.

6. Protein by heat and acetic method
7. Bile salt, Bile pigments and Urobilinogen determination
8. Determination of Ketone bodies
9. Determination of various parameters of urine by uristik method.
10. Preparation of hemolysate

Field Work:

1. Visit to an area to document environmental assets; river/forest/flora-fauna etc.
2. Visit to a local polluted site: urban/ rural/industrial/agricultural.
3. Study of common plants, insects, birds & basic principles of identification.
4. Study of simple ecosystem; pond, river etc.

401 IMMUNOLOGY & SEROLOGY

Unit-I

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

Cell and organs of immune system, Phagocytosis

Unit-II

Antigens and haptens : Properties ,foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens.

Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype, Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody

Unit-III

Mechanism of humoral and cell mediated immune response.

Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans;

Antigen presenting cells, antigen processing and presentation

Complement system and complement fixation test.

Unit-IV

Laboratory tests for demonstration of antigen – antibody reaction such as agglutination, precipitation, ELISA, RIA, Immunofluorescence,

Unit-V

Rheumatological diseases, etiology and pathogenesis and lab investigations

402 HISTOPATHOLOGY & HISTOTECHNIQUES

Unit-I

Introduction of histopathology, cytology & histotechniques, laboratory organization, care & maintenance of equipments used in histotechnology lab ,Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology

Unit-II

Tissue and its types, Location and function, Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor

Decalcification, decalcification methods, types of decalcifying fluid, Processing of bones and teeth, Embedding media, its type and properties

Unit-III

Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Section cutting, fault and remedies, Section adhesive

Unit-IV

Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis

Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye,

mordant, accelerators, accentuators, metachromasia, metachromatic dyes

Unit- V

Progressive, regressive, vital, supravital staining, types of hematoxylin, Haematoxylin and eosin staining, use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages, refractive index

403 IMMUNOHEMATOLOGY & BLOOD BANKING

Unit-I

Basic Principles of Blood Banking, Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system, Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method,

Unit-II

Other blood group system such as Lewis, MNS, Kell Duffy etc
Anticoagulants and preservative used in blood bank
Donor selection criteria, Blood collection and processing

Unit-III

Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reaction/Agglutination

Unit-IV

Blood components and its preparation, preservation, storage and transportation
Indications for different blood component transfusion, Blood transfusion reaction and its type, HDN
Introduction of stem cell banking and bone marrow transplantation.

Unit-V

Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis
Quality control of reagents, equipments, blood components used in transfusion medicine.
Role of NACO, Indian Red Cross Society, DGHS and blood transfusion services.

404 PRACTICAL-IV

Immunology & Serology

1. To perform HIV Tridot test.
2. To perform radial immunodiffusion test.
3. To perform immunoprecipitation method.
4. To perform HBsAg rapid test.
5. To perform ASO test
6. To perform ELISA test.
7. To perform TB IgG&IgM test
8. To perform Dengue IgG&IgM test
9. To perform typhidot test.
10. Introduction of Allergy panel
11. Montoux test.

Histopathology & Histotechniques

1. Demonstration of glass wares and equipment used in histopathology lab.
2. To prepare alcohol of different concentration.
3. To prepare formalin from stock solution.
4. To sharpen knife by honing and stropping.
5. Grossing of tissue
6. To perform tissue processing by manual method.
7. To perform section cutting of paraffin embedded tissue.
8. To fix the smear on glass slide.
9. To perform hematoxylin and eosin staining.
10. Mounting and preservation of slide.

Immunoematology & Blood Banking

1. Demonstration of apparatus and equipments used in blood banking.
2. To prepare different percent of cell suspension.
3. To perform ABO & Rh blood grouping by slide and tube method.
4. To perform forward & reverse grouping.
5. To perform Cross match.
6. To perform Coomb's test.
7. To perform Rh titre
8. To perform Transfusion transmissible marker.
9. Preparation of various blood components and their quality control

405 CLINICAL POSTING-II

Hospital Posting:

Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centres to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.

501 CLINICAL ENZYMOLOGY & AUTOMATION

Unit-I

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

Unit-II

Coenzyme: Classification, various types and function, structure of NAD⁺, NADP⁺, FAD and FMN, PPP

Units for measuring enzyme activity, factors affecting enzyme level in serum/ plasma.

Clinical assay & its type, kinetic assay and end point assay for the enzymes

Unit-III

Enzyme kinetics, the Michaelis-Menten equation and its physiological significances,

Enzyme Inhibition, types of inhibitors of enzyme

Unit-IV

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

Unit-V

Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing, Hospital Laboratory Management

502 MEDICAL MICROBIOLOGY

Unit-I

Cultural Medias: Liquid and solid medias, containers for medias, distribution of medias in tubes, bottles and Petri dishes. Common ingredients of cultural Medias. Synthetic media, peptone water, nutrient agar and broth, chocolate and blood agar, meat extract broth, milk agar etc. Selective media

Unit - II

Collection, transport, processing, storage of various samples for microbiological analysis such as

urine, blood, pus, sputum, skin scraping, stool etc.

Pure culture isolation and preservation: Streaking, serial dilution and plating methods; cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria.

Unit-III

Growth and Nutrition of Bacteria: various phases of growth, typical growth curve, Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors, Vitamins, Temperature, pH, Osmotic Pressure, Oxygen and Carbon Di Oxide on microbial growth.

Unit-IV

Preparation of container and swabs for collections of specimens for microbial examinations.

Preservation of Micro-organisms: Periodic subculture method, cold storage, freezing, deep freezing, lyophilisation methods. Total and viable counts of bacteria.

Flowchart of lab diagnostic procedures. documentation of specimen in laboratory.

Unit-V

Specific serological methods of diagnosis, Test for bacterial sensitivity to antimicrobial agents and their interpretation, Specific culture and drug sensitivity methods.

Advanced diagnostic techniques in Medical Microbiology

503 PARASITOLOGY

Unit-I

Introduction of parasites, host, zoonosis, host parasites relationship, sources of infection, mode of infection, pathogenesis, immunity in parasitic infection, lab diagnosis

Unit- II

Protozoology: Entamoebahistolytica, Malarial Parasites, Leishmania, Trypanosomes, their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Unit-III

Helminthology: Introduction and classification, Taeniasolium, TaeniaSaginata, Fasciola, Ascaris, Wuchereriabancrofti their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Unit-IV

Hookworm, Trichuris, Dracunculus their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Unit-V

Diagnostic methods in Parasitology: Introduction, Examination of stool, urine, blood, Culture methods, Immunological diagnosis and serology

504 DIAGNOSTIC CYTOLOGY

Unit-I

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

Unit- II

Instruments and equipments used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytospin technique, Staining such as PAP, Diff-quick, MGG, H&E, Shorr staining, significance of PAP-HPV, Destaining and restaining of slides, Cover slipping

Unit-III

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

Unit-IV

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

Unit-V

Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device

505 PRACTICAL-V**Clinical Enzymology & Automation**

1. To perform enzyme estimation of LFT
2. To perform enzyme estimation of Cardiac profile
3. Determination of Troponin I
4. To perform enzyme estimation of Pancreatic disorder
5. To perform estimation of ACP.
6. Antenatal profile
7. Estimation of bicarbonate
8. Arterial blood gas analysis
9. Determination of Calcium
10. Creatinine and urea clearance test

Medical Microbiology

1. Collection and processing of various specimens such as urine, blood for culture
2. Preparation of culture media- Nutrient agar , Mac conkey agar , Blood agar media and Chocolate agar
3. Demonstration of culture methods- Streaking method and Spreading method
4. Cultivation of anaerobic bacteria
5. Antibiotic sensitivity test
6. Processing of culture growth for biochemical tests and identification of microorganisms.
7. Biochemical tests for species identification

Parasitology

1. Leishman staining for malarial parasites
2. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm
3. Saline wet mount for observing ova and eggs of parasites.
4. Iodine wet mount for observing ova and eggs of parasites.
5. Concentration of stool samples by floatation method
6. Zinc sulphate conc. Method for stool sample
7. Demonstration of various parasites by permanent slides.
8. Concentration of stool sample by sedimentation method
9. Serological diagnosis of Leishmania
10. Aldehyde Chopra test for Kala Azar
11. Malaria card test

Diagnostic Cytology

1. Preparation of various cytological fixatives
2. Preparation of various stains used in cytology
3. Preparation of smear
4. To perform PAP staining
5. To perform Giemsa staining on fluid sample
6. To prepare cell suspension
7. Processing of various fluid samples

601 CLINICAL ENDOCRINOLOGY & TOXICOLOGY**Unit-I**

Hormones, Classification of hormones, organs of endocrine system their secretion and function,

regulation of hormone secretion, Mechanism of action

Unit-II

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T3, T4, TSH, FT3, FT4, TBG, Disorder associated with thyroid dysfunction.

Unit-III

Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test

Unit-IV

Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion

Unit-V

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

602 ADVANCE DIAGNOSTIC TECHNIQUES

Unit-I

Chromatography, its principle, types and applications.

Paper Chromatography, Thin layer chromatography, HPLC, Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis.

Unit-II

Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel electrophoresis, buffer systems in electrophoresis.

Electrophoresis of proteins and nucleic acids, haemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.

Unit-III

Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultracentrifugation.

Unit-IV

Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry

Unit-V

Immunoassay: ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

603 CLINICAL VIROLOGY

Unit 1

Nature and Properties of Viruses

Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses

Unit-II

Isolation, purification and cultivation of viruses

Viral taxonomy: Classification and nomenclature of different groups of viruses

Unit III

Modes of viral transmission: Persistent, non-persistent, vertical and horizontal

Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions

Unit- IV

Poxviruses, Herpesviruses, hepatitis viruses, retroviruses-HIV, Picorna viruses, rhabdoviruses, orthomyxoviruses and paramyxoviruses, TORCH profile, Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis

Unit V

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of

oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination

604 PRACTICAL

Clinical Endocrinology & Toxicology

1. To determine T3 conc. in serum sample.
2. To determine T4 conc. in serum sample.
3. To determine TSH conc. in serum sample.
4. To determine LH conc. in serum sample.
5. To determine FSH conc. in serum sample.
6. To determine Prolactin conc. in serum sample.
7. To determine TSH conc. in serum sample.
8. To perform TRIPLE test.
9. Demonstration of male and female infertility test.
10. Beta HCG

Advance Diagnostic Techniques

1. To perform separation of amino acids by paper chromatography
2. To perform separation of amino acids by thin layer chromatography
3. To perform separation of DNA by Agarose gel electrophoresis.
4. Separation of protein by PAGE
5. Separation of protein by paper electrophoresis
6. Separation of haemoglobin

Clinical Virology

1. To perform HBsAg/ Australia Ag by rapid method
2. To perform HBsAg by ELISA
3. To perform HIV Tridot method.
4. To perform HIV by ELISA
5. To perform Dengue IgG/IgM
6. To perform TORCH profile
7. Demonstration of PCR HBV
8. Demonstration of PCR HIV Viral load

605 CLINICAL POSTING

Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples.

Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centres to different labs. Process of performing various tests in different labs.

Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections. The faculty shall submit the assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.