PhD Entrance Syllabus
Department of Medical Laboratory Technology
School of Allied Health Science
Galgotias University

Unit-I: Clinical Biochemistry

Diabetes Profile, Lipid Profile, Kidney Profile, Pancreatic Function Test, Liver Function Test, Cardiac Function Test and their patho-physiology, Gastric And Intestinal Function Tests with their clinical utility, Mineral metabolism and electrolyte balance, Acid base balance and its mechanism.
Autosomal recessive disorders, Autosomal dominant disorders, Karyotyping, prenatal diagnosis. Molecular diagnostic techniques: DNA probes; restriction fragment length polymorphism (RFLP), polymerase chain reaction (PCR), amplification of mRNA. Molecular diagnosis of genetic diseases: cystic fibrosis, Hemachromatosis, thalassemias, sickle cell diseases, AIDS.

Enzyme classification, Enzyme inhibition, Co-enzymes, Enzymes in Clinical Medicine: Cholinesterase, Amylase, Lipase, Aldolase, Alkaline and Acid phosphatase, Glucose-6-phosphatase; 5'-nuceotidease, GGT. Enzymes in the Diagnosis of Diseases: assessment of myocardial infarction, hepatitis, jaundice, pancreatitis, cancer, neurodegenerative.

Unit II: Immunology:

Antigen and antibodies, Active and passive immune system, stem cells, Complement fixation, structure and classes of antibodies, genetic basis of antibody diversity. Concept of Hapten & Epitopes.

MHC I and II: structure and antigen presentation. T and B lymphocytes activation and role in humoral and cell mediated immunity.

Vaccines live and attenuated, killed, multi-subunit and DNA vaccines. Hypersensitivity and auto immune diseases, ELISA, RIA, Hybridoma Technology, significance of monoclonal antibodies.

Unit III: Hematology and Immunohematology

Ultrastructure of cell membrane. Basic structure of Blood cells. The extracellular matrix□collagen, elastin, fibrillin, fibronectin, laminin and proteoglycans. Cytochemical staining of

Leucocytes, Hemorrhage, hemolytic anemia. Sickle cell anemia, Thalassemia, Polycythemia,

Non Neoplastic Disorders of white blood cells, Neoplastic proliferation of white cells, Plasma

cell disorders, Thrombocytopenia, Coagulation disorders, Splenomegaly, disorders of thymus

Neoplasia, Types of cancer, Differentiation and anaplasia, cancer epidemiology, Molecular basis of cancer, basis of multi-step carcinogenesis, Etiology of cancer, Carcinogens, classification of carcinogens, mode of action of carcinogens, laboratory diagnosis of cancer, molecular profiling of cancer, Cellular adaptation, overview of cell injury, mechanisms of cellular injury, cellular adaptation to cellular injury, Pathologic calcification, Programmed cell death, cell apoptosis, cellar regeneration, control on cell growth, cellular differentiation, repair of connective tissue, fibrosis. Growth factors in cell regeneration and fibrosis. Various Antigen and antibody of RBCs. Blood banking technology.

Unit IV: Medical Laboratory Techniques

Amino acids, extraction, qualitative and quantitative tests, determination of proteins in serum, plasma and CSF. Determination of glucose in body fluids, glucose tolerance test and hypoglycemia determination, analysis of ketone bodies, method of estimation of lactate, pyruvate and glycated hemoglobin in blood. Analytical methods for estimation of triglycerides, high density lipoproteins, low density lipoproteins, apolipoproteins.
Laboratory application of nucleic acid technologies to elucidate, diagnose, monitor disease state and to evaluate non-disease status techniques for the detection of DNA and RNA structures at the molecular level, Basic principles and techniques-nucleic acid biochemistry. Relation to laboratory evaluation of disease and establishing a molecular diagnostic laboratory facility, equipment, personnel. Clinical testing process, quality assurance, clinical validation and accreditation. Molecular genetics of hematopoietic neoplasm-lineage probes in the evaluation of hematopoietic neoplasma- Molecular analysis of chromosomal aberrations in leukemias and lymphomas, Molecular diagnosis of genetic diseases. Choice of techniques, choice of applications, special concept unique to molecular genetic disorders, specific disease examples. Application of molecular methods in clinical microbiology.

Unit: V Clinical Microbiology

History and recent developments - spontaneous generation - Biogenesis-contributions of Louis Pasteur Leewenhoek, Lazaro Spallanzani, John Tyndall, Joseh Lister - Robert Koch. Microbial kingdoms - Five kingdoms - cell theory - Binomial nomenclature of microbes. Anatomy of prokayotes and eukaryotes - structure and function of cell wall, cilia, flagella, slime layer, capsule, pili, cytoplamic membrane and cytoplasmic inclusions, sporulation. Kingdom prokaryotes - classical techniques of microbial identification - morphological, physiological and biochemical propertiesSpecial needs dispensing: Occupational dispensing, Hazards in the workplace, Occupational health safety legislation, Visual Ergonomics, Visual hygiene Sports and Industrial eye protection: Standards covering eye protection, Lens materials & impact resistance, Frame & eye protection. Classification and general properties of medically important bacteria. Recommendation for collection, transport of specimens, isolation of

bacteria from clinical specimens. Staphylococcus streptococcus Neisseria and Bordetella. Corynebacterium, Listeria, Mycobacetrium.Bacillus, Vibrios, Aeromonas, Campylobacter,

Helicobacter, Pseudomonas, Brucella, Haemophilus, Enterobacteriaceae, Salmonella, Shigella, Proteus, Escherichia, Klebsiella, Clostridium, Mycoplasma, Rickettsiae, Spirochaetes, Treponema and Leptospira. General Properties of viruses - Detection of viruses and antigens in clinical specimens - Serological diagnosis of virus infections. Cultivation of viruses. Arthropod borne and rodent borne virus diseases - Picorna viruses and diseases. Hepatitis viruses: Rabies and other neuro viruses: Orthoinyxo and paramyxo viruses. Pox, Adeno, Herpes, Reo, Rota and HIV Virses, Oncogenic viruses, Viral vaccines, their Preparation and thei immunisation schedules. Viruses of importance to bacteria - Bacteriophages - Their structure, types – Typing and application in bacterial genetics. Morphology, Taxonomy, clasification of fungi, detection and recovery of fungi from clincical specimens. Dermatophytes and agents of superficial mycoses. Trichophyton. Epidermophyton and Microsporurn. Yeasts of medical importance- Candida, cryptococcus. Mycotoxins, Dimorphic fungi causing systemic mycoses, Histoplasma, Coccidioides, Opportunistic fungi.Diagnosis of fungal infection. Immunity to fungal infections. Antifungal agents, testing methods and quality control. Introduction to medical Parasitology - Classification, Protozoa - Entamoeba - Plasomodium, Leishmania - Trypanosoma -Giardia Trichomonas - Balantidium.Platyhelminthus -- Taenia - Fasciola - Paragonimus - Schistosorna. Nematihelminthes - Ascaris - Ankylostoma - Enterobius – Trichuris - Wuchereria - Dracunculus. Laboratory techniques in Parasitology. Examination of faeces for ova and cysts - Concentration methods. Blood smear examination for Parasites. Cultivation of Protozoan Parasites. Total Laboratory automation, Anaerobic chambers(automated), BACTEK, Colony counter, Spiral Plating.

Unit: V Histopathological techniques

Definition, Morphology and physiology of cell, laboratory management and planning, sources and types histological specimens, kinds of histological presentations. Recording and labeling, fixation, properties of fixing fluids, classification and composition of fixing fluids. Advantages and disadvantages of secondary fixatives. Processing of histological tissues, Tissue Processor - dehydration and cleaning. Embedding - Water soluble substances, embedding in paraffin nitrocellulose. Technique of processing bone for histological studies. Mounting - Techniques, various mountings. Decalcification of calcified tissue. Equipment for sectioning: Microtome, knife, honing and stropping. Types, care and use of microtome. Techniques and principles of sections cutting – Frozen Section Techniques: Carbon Dioxide Freezing, Cryostat and freezing microtome. Technique for sectioning – Paraffin embedded tissue, Errors in sectioning and remedies. Attaching blocks to carriers. Preparation of slide, deparaffinization, Staining – theory, types of staining agent. Automatic slide stainer, Instruments for grossing, electric saw, Microphotography – technique. Mordents and differentiation. Hematoxillin and Eosin staining. Types of hematoxillin and its preparation. Eosin stock stain and other counter stains used. Cytology – introduction, definition, types of cytological specimen, preparation of slide for microscopic studies, stains used. FNAC, definition, techniques involved in preparation of smear and staining. PAP smear. Preparation of cell blocks, mailing of slides. Flow Cytometry, FACS, Karyotyping, Non disjunction, Chromosomal abnormalities, FISH.