M.Sc. MLT in Immunology and Microbiology

Course Content

FIRST YEAR

PAPER I: Human Anatomy & Physiology

Unit I

Cell structure, division & function
Cell organelles
Tissue: Types of tissues and their functions
Skeletal system

Unit II

Digestive system: Physiology and anatomy of mouth, stomach, intestine
Absorption of food and its excretion
Role of Bile in digestion and excretion
Liver function and a brief description of liver and biliary tree

Unit III

Respiratory system: Brief description of larynx, bronchi, lungs
Cardiovascular system: Anatomy and Physiology of heart, arteries and veins
Circulation: Systematic and pulmonary (in brief)
Brief review of chambers

Unit IV

Urinary system: Structure and Function of the Kidney, uterus, bladder,
urethra and nephron
Give special emphasis on formation of Urine
Physiology and Anatomy of male and female reproductive organs
Endocrine: Pituitary, thyroid, parathyroid, thymus, adrenals and pancreas

Unit V

Central nervous system: Brain, spinal cord and meninges explain with its functions
Skins: Structure and Functions
Study and give small project on bones and cartilages

PAPER II: BIOCHEMISTRY

Part A Basic Biochemistry

Bioenergetics, Entropy, Enthalpy & their basic introduction
Concept of free energy, Thermodynamics 1st & 2nd Law.
Carbohydrate: Structure, properties,, chemical reactions & functions
Amino Acids: Essential & non Essential amino acids with structure & function
Proteins: Primary, Secondary, tertiary & quaternary (Overview)
Lipids: Structure, Classification & properties
Enzymes: Classification, enzyme action & their mechanism. Enzyme

inhibition, Mode of action Of chymotrypsin & related enzymes
Nucleic Acids: Structure of Purine & pyrimidine bases
Nucleotide & Nucleosides
DNA & RNA: Structure & Properties
Vitamins

Part B Clinical Biochemistry
Carbohydrates: Carbohydrates intermediate metabolism, glycogenesis, glycogenolysis, gluconeogenesis & glycolysis.
TCA, HMP, and its regulations
Disorcerds of carbohydrates metabolism related to each cycle (inborn error of metabolism)
Proteins: Different metabolic pathway of amino acid
The flow sheet of amino acids oxidation.
Transamination, oxidativedeamination and pathways leading to acetyl co-A.
Decarboxylation of Amino acids, formation of nitrogenous excretion
products. Urea cycle and ammonia excretion.
Lipid: Biosynthesis and oxidation of fatty acids (odd & even number)
Ketone bodies formation and their oxidation
Regulation and inborn error of lipid metabolism
Biochemical aspects of Hormone: Hormone receptors and intracellular
messengers, Adenylate cyclase, protein kinase and phosphodiesterase.
Role of Insulin, glucagons, epinephrine and their mechanism
Various endocrine and regulatory systems mediated by cyclic AMP.
Vitamin: Fat and Water soluble and their deficiency
Mineral metabolism : Minor and Major (cu, Fe, Ca, Mg & P)
Inborn error of Nucleic acids metabolism

Practical:
Estimation of Protein by Folin's method in a given sample.
Estimation of Glucose / GOD – POD method
Estimation of bilirubin by kit method in a given sample
Estimation of Urea by kit method in a blood / Urine
Total protein test – A:G ratio
Urine Analysis Chemical, Physical, Microscopical
Draw a standard graph of GTT curve.
Demonstration of electrophoresis
Estimation of Sodium & Potassium by flame photometer.

PAPER III GENERAL MICROBIOLOGY AND GENETICS

1. History and Pioneers in Microbiology.
2. Microscopy.
3. Morphology of bacteria and other microorganisms.

4. Nomenclature and classification of microbes.
5. Growth and nutrition of bacteria.
6. Bacterial metabolism.
7. Sterilization and disinfection.
8. Bacterial toxins.
9. Bacterial antagonism: Bacteriocins.
10. Bacterial genetics.
11. Gene cloning.
12. Antibacterial substances used in the treatment of infections and drug resistance in bacteria.
13. Bacterial ecology-Normal flora of human body, Hospital environment, Air, Water and Milk.
14. Host parasite relationship.

PRACTICAL

1. Preparation and pouring of media – Nutrient agar, Blood agar, MacConkey agar, Sugars, Kligler iron agar, Robertson's cooked meat, Lowenstein Jensens, Sabouraud's. including selective culture media, etc.
2. Operation and maintenance of autoclave, hot air oven, distillation plant, filters like Seitz and Membrane and sterility tests.
3. Washing and sterilization of glassware.
4. Preparation of reagents – oxidase, kovac etc.,
5. Disposal of contaminated materials.
6. Testing of disinfectants – Phenol coefficient test and its use.
7. Quality control of media, reagents etc.,
8. Aseptic practice in Lab and safety precautions.
9. Care and maintenance of common laboratory equipments.
10. Collection of specimens for Microbiological investigations.
11. Preparation of stains viz, Grams, Alberts, Capsules, spores, Ziehl Neelsens etc., and performing of staining.
12. Care and operation of microscopes viz., Dark ground, Phase Contrast and Fluorescent microscope, (Electron microscope).
13. Care and breeding of lab animals viz. Mice,Rats, Guinea pigs, Rabbits, and also experiments on various laboratory animals.
14. Skin tests: Mantoux, Lepromin, Casoni's etc.

PRACTICAL

1. Preparation and pouring of media – Nutrient agar, Blood agar, MacConkey agar, Sugars, Kligler iron agar, Robertson's cooked meat, Lowenstein Jensens, Sabouraud's. including selective culture media, etc.
2. Operation and maintenance of autoclave, hot air oven, distillation plant, filters like Seitz and Membrane and sterility tests.
3. Washing and sterilization of glassware.
4. Preparation of reagents – oxidase, kovac etc.,
5. Disposal of contaminated materials.

6. Testing of disinfectants – Phenol coefficient test and its use.
7. Quality control of media, reagents etc.,
8. Aseptic practice in Lab and safety precautions.
9. Care and maintenance of common laboratory equipments.
10. Collection of specimens for Microbiological investigations.
11. Preparation of stains viz, Grams, Alberts, Capsules, spores, Ziehl Neelsens etc., and performing of staining.
12. Care and operation of microscopes viz., Dark ground, Phase Contrast and Fluorescent microscope, (Electron microscope).
13. Care and breeding of lab animals viz. Mice,Rats, Guinea pigs, Rabbits, and also experiments on various laboratory animals.
14. Skin tests: Mantoux, Lepromin, Casoni's etc.

PAPER IV : SYSTEMIC BACTERIOLOGY

1. Isolation, description and identification of bacteria
2. Staphylococcus and Micrococcus: The anaerobic gram positive cocci
3. Streptococcus and Lactobacillus
4. Neisseria, Branhamella & Moraxella
5. Corynebacterium and other coryniform organisms
6. Bacillus: The Aerobic spore bearing bacilli
7. Clostridium: The anaerobic spore bearing bacilli
8. Enterobacteriaceae
9. Vibrios, Aeromonas, Plesiomonas Campylobacter and spirillum
10. Haemophilus and Bordetella
11. Pasteurella and Francisella
12. Brucella
13. Mycobacteria
14. Actinomyces, Nocardia, and Actinobacillus
15. Pseudomonas
16. Spirochaetes
17. Chlamydiae
18. Rickettsiae
19. The Bacteriodaceae : Bacteriodes, Fusobacterium and leptotrichia
20. Mycoplasmatales : Mycoplasma, Ureaplasma, Acholeplasma
21. Erysipelothrix and listeria
22. Chromobacterium, Flavobacterium, Acinetobacter and Alkaligens
23. Miscellaneous bacteria

PRACTICAL

SYSTEMIC BACTERIOLOGY

.

1. Collection of specimens for Microbiological investigations. .

2. Identification of bacteria of medical importance upto species level (except Anaerobes which could be upto generic level)
3. Antibiotic sensitivity testing and its quality control
4. Tests for Beta lactamases
5. T echniques of Anaerobiosis

PAPER V: Immunology

Unit – I

Immune response: Immunity, Type (Innate & adaptive immune response)
Organs of Immune System: Primary and Secondary lymphoid organ
Ontogeny and phylogeny of Lymphocytes: T and B Lymphocyts, Null

Unit – II

Cell of Immune System: Mononuclear cell and granulocytes, Antigen presenting cell.
Antigen, Heptanes: Factors effecting immunogenicity,m epitopes (Properties of it)
Antibodies: Structure , Types and function

Unit – III

Complement System : Role of complement system in immune response, complements and Components and activation pathways.
Monoclonal antibodies: Production characterization and applications in diagnosis, therapy and basic research.
Antigen-Antibody interaction, avidity & affinity measurement.

Unit – IV

Hypersensitivity: Definition, factor causing hypersensitivity
Common hypersensitivity reaction, types, classification based on the time taken for reaction
Auto Immune disease

Unit – V

Immunodiagnostics: Precipitation techniques, Agglutination, Fluoresence techniques
ELISA, RIA
Double diffusion and Immuno-electrophoresis.
Immunidiagnostics: VDRL test, Widal test, RA factor, Blood grouping, Rh typing, Comb's test

PRACTICAL

IMMUNOLOGY

1. Collection and preservation of serum.
2. Preparation of antigens.
Preparation of adjuvants and rising of antisera in animals.
3. Performance of common serological tests.
4. Immuno electrophoresis.
5. Immunodiffusion and CIEP.
6. Radial immuno-diffusion.
7. ELISA.
8. CD4, CD8 counts.

SECOND YEAR:

PAPER VI: PARASITOLOGY

1. Protozoan parasites of medical importance:
   Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Babesia, Balantidium etc.
   Pneumocystis Carinii
2. Helminths: All those medically important heminths belonging to Cestodes, Trematode and Nematode.
   Cestode: Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipyllidium, Multiceps etc.
   Trematode: Schistosoma, Fasciola, Gastrodiscoides, Paragonimus, Clonarchis, Opisthorchis, etc.,
   Namatodes: Trichuris, Trichinella, Strongyloides, Ancylostoma, Ascaris, Enterobius, Filarial worms, Dracunculus, medinensis etc.
   Ectoparasites: Common arthropods and other vectors.

PRACTICAL

PARASITOLOGY

1. Examination of faeces for ova and cysts: Direct and concentration methods.
2. Egg counting techniques.
3. Examination of peripheral blood, urine, CSF, and other fluids for parasites.
4. Examination and identification of histopthology slides for parasitic infection.
5. Serological tests for parasitic diseases.
6. Preservation of parasites.
7. Permanent staining techniques for parasites.
8. In-vitro culture for parasites, viz., Malarial parasites, Amoeba, and Ancylostoma.
9. Maintenance of Toxoplasma.

PAPER VII: Virology

1. Nature of viruses
2. Classification of viruses
3. Morphology, virus structure
4. Viral replication
5. The genetics of viruses
6. Pathogenicity of viruses
7. Epidemiology of viral infections
8. Vaccines and Anti viral drugs
9. Bacteriophages
10. Pox viruses
11. Herpes viruses
12. Vesicular viruses

13. Toga viridae
14. Flavi viridae
15. Arena viridae
16. Marburg and Ebola viruses
17. Rubella
18. Orbi viruses
19. Influenza viruses
20. Respiratory diseases: Rhinoviruses, Adenoviruses and Corona viruses
21. Paramyxoviridae
22. Enteroviruses: Polio & other enteric viruses
23. Hepatitis viruses
24. Rabies virus
25. Slow viruses
26. Human immunodeficiency viruses
27. Oncogenic viruses
28. Teratogenic viruses
29. Viruses of gastroenteritis

PRACTICAL

VIROLOGY

1. Preparation and identification of CPE in various tissue cultures.
2. Serological tests for viral infections.
3. Handling of experimental animals and collection of various samples for evidence of viral infection in animals.
    1. Laboratory diagnosis of AIDS.
    2. Laboratory diagnosis of Hepatitis.
    3. Prevention and laboratory safety measures.

PAPER VIII: MYCOLOGY & RECENT ADVANCES IN MICROBIOLOGY

A. MYCOLOGY

1. The morphology and reproduction in fungi and antimycotic agents,
2. Classification of fungi,
3. Contaminant and opportunistic fungi
4. Superficial mycotic infections.
5. Fungi causing subcutaneous mycoses
6. Fungi causing systemic infections.

B. Clinical microbiology

1. Central Nervous System infection (Meningitis, Brain abscess, encephalitis etc.)

2. Lower Respiratory Tract infection
3. Upper Respiratory Tract infection
4. Urinary Tract infection
5. Genital Tract infection
6. Gastro intestinal tract infection
7. Wound and soft tissue infection
8. Septicemia
9. Eye and ear infection
10. Hospital acquired infections

PRACTICALS

MYCOLOGY

1. Collection and processing of clinical specimens for fungi.
2. Special techniques like Woods lamp examination, hair baiting techniques, slide cultures.
3. Stock culture maintenance.
4. Animal pathogenicity test for Cryptococcus and Candida.

CLINICAL MICROBIOLOGY

1. Collection of specimens for Microbiological investigations.
2. Techniques of Anaerobiosis.
3. Identification of bacteria of medical importance upto species level (except Anaerobes which could be upto generic level)
4. Antibiotic sensitivity testing and its quality control
5. Care and breeding of lab animals viz. Mice,Rats, Guinea pigs, Rabbits, and also experiments on various laboratory animals

PAPER IX: IMMUNOPATHOLOGY

UNIT - 01

Autoimmunity - classification of auto immune disease – haemocytolytic auto immune disease, localized auto immune disease, and systemic auto immune disease. pathogenesis of auto immune disease. immunology of transplantation - autograft, allograft, isograft and xenograft.

UNIT - 02

Antigens - structure and properties - types - iso and allo - haptens,
adjuuvants-antigen specificity. vaccines and toxoids. immunoglobulins - structure - heterogeneity - types and subtypes-properties (phsico, chemical & biology); theory of antibodies production. compliment - structure - components - properties and functions of complement components; complement pathway and biological consequences of complement activation.

UNIT - 03

Blood groups, blood transfusion and rh incompatibilities.
hyper sensitivity reactions :antibody mediated type-1. anaphy type-2.

antibody dependent cell cytoxicity type-3. immune complex mediated reaction type-4. cell mediated hypersensitivity reaction. tumor immunology - tumor antigens, cells involved severe combined deficiency autoimmune diseases-possible mechchanisms of autoimmunity: sequestered antigens, altered self, lack of suppressor t cells. human autoimmune disease-systemic lupus erythematous, myasthenia gravis mhc and diseases-hla association with disease, mechanisms of disease association.

PAPER X: Research Methodology & Techniques

Introduction to Research: Definition, Scope, Limitations, and Types.
Objectives of Research
Research Process
Research Designs
Data Collection: Secondary Data, Primary Data, and Methods of Collection.
Scaling Techniques: Concept, Types, Rating scales & Ranking Scales
Scale Construction Techniques, Multi Dimensional Scaling.
Sampling Designs: Concepts, Types and Techniques
Sample Size Decision
Theory of Estimation and Testing of Hypothesis
Small & Large Sample Tests, Tests of Significance based on t, F , Z test and Chi-SquareTest.
Designing Questionnaire.
Interviewing.
Tabulation, Coding, Editing.
Interpretation and Report Writing.