



مؤلانا آژاڈ نیشنل اردو یونیورسٹی

مولانا آزاد نیشنل اردو یونیورسٹی

MAULANA AZAD NATIONAL URDU UNIVERSITY

(A Central University established by an Act of Parliament in 1998)

Accredited 'A+' grade by NAAC

SCHOOL OF SCIENCES

**B.Voc. & M.Voc. Program (MIT & MLT)**



**Proposed M.Voc. Medical Laboratory Technology**  
**(02 Years Duration) with 04 Semesters**

**SEMESTER - II**

Component	Title of The Paper	Credits
<b>Theory</b>		
Paper - 1	Clinical Biochemistry (Theory)	06
Paper - 2	Virology and Parasitology (Theory)	06
Paper - 3	Histopathology and Cytology (Theory)	06
Paper - 4	Bio statistics & Research Methodology (Theory)	04
<b>Practical</b>		
Paper - 1	Clinical Biochemistry (Lab)	02
Paper - 2	Virology and Parasitology (Lab)	02
Paper - 3	Histopathology and Cytology (Lab)	02
Paper - 4	Bio statistics & Research Methodology (Lab)	02
<b>Total Credit</b>		<b>30</b>

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 1) Clinical Biochemistry - II (Theory)**  
**Credits - 06**

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**Unit-1.** Metabolism of Carbohydrates, Lipids (glycolysis, krebs cycle, gluconeogenesis, glycogenesis, glycogenolysis, cholesterol synthesis, Degradation, fattyacid, synthesis, lipoprotein metabolism ketone bodies metabolism

**Unit-2.** Aminoacids metabolism phenylalanine metabolism, tryptophan, tyrosine, methionine, cysteine, homocysteine, glycine, Histidine and arginine metabolism.

**Unit-3.** Nucleic acid metabolism: purine nucleotide metabolism and pyrimidine metabolism

**Unit-4.** Minerals metabolism: Calcium, Phosphorous, magnesium, sodium, chloride, potassium, iron, zinc, Copper, Selenium, Iodine, Manganese, Fluoride,

**Unit-5.** Vitamin metabolism Vitamin A, D, K, E, Water soluble Vitamins, C and B complex, Chemistry, RDA, Dietary requiremenst, functions, disease states, diagnostic investigations and importance.

**Unit-6.** Organ function tests: Liver. Renal, Pancreas, Gastric, clinical significance and diagnostic relevance, Hormones, structure, functions and their clinical investigations.

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 1) Clinical Biochemistry - II (Practical)**  
**Credits - 02**

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- Estimation of Vit D, aminoacids.
- Extraction of DNA
- Estimation of calcium, Copper, Zinc
- Estimation of Potassium, Iron, Magnesium, Sodium, Chloride, folic acid, B12, B6
- Demonstration of slides of cell organelles
- LFT, RFT, Hormones analysis.

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 2) Virology and Parasitology - II ( Theory)**  
**Credits - 06**

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- Unit-1.** **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 Lymphocytes, Null **Cell of Immune System:** Mononuclear cell and granulocytes Antigen presenting cell. Antigen and Heptanes Factors effecting immunogenicity Properties of Epitopes Antibodies—Structure, Types and function
- Unit-2. Complement System:** Role of complement system in immune response Complements and Components and activation pathways.
- Unit-3.** Monoclonal antibodies Production characterization and applications in diagnosis, Therapy and basic research Antigen-Antibody interaction Avidity & affinity measurement.
- Unit-4. Infection and infectious agents** Definition, types and mode of transmission Hospital infections –causative agents, mode of transmission and prophylaxis Virulence factors in microbes Brief description, pathogenicity and lab diagnosis of pyogenic infections, enteric fever, bacillary dysentery, cholera, tuberculosis and syphilis Introduction to viruses Briefly describe HIV, hepatitis, polio, rabies, arboviral infections, herpes and myxoviral infections.
- Unit-5. PARASITOLOGY:** Introduction & Classification, Names of the parasites Protozoology: Entamoeba histolytica, Trichomonas vaginalis, Giardia lamblia, Hemoflagellates (in brief), Malarial Parasites, Opportunistic protozoan infections in AIDS. Cestodes: D. latum, E. granulosus, T. saginata, T. solium, H. nana, H. diminuta. Nematodes: Ascaris lumbricoides, Ancylostoma duodenale, Necator americanus, Strongyloides stercoralis, Trichuris trichiura, Enterobius vermicularis, Dracunculus Medinensis, Wuchereria bancrofti.
- Unit-6. Morphology of Viruses:** General morphology and ultrastructure of Viruses Capsids—Helical Symmetry, icosahedral symmetry and complex symmetry. Envelope—Glycoprotein and matrix protein Viral genome—their types of structure **Cultivation of Viruses:** Cultivation of Viruses in embryonated eggs Experimental animals and cell culture Primary and secondary cell culture Suspension cell culture and monolayer cell cultures Assays of viruses-Physical and chemical methods of assays Serological methods Haemagglutination Haemagglutination inhibition, Complement fixation Immuno fluorescence (IFA) ELISA RIA.

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 2) Virology and Parasitology - II ( Practical)**  
**Credits - 02**

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- **Immunological reaction**
- **Demonstration of viruses**
- **Culture of parasites**
- **Precipitation, Agglutination, Complement Fixation Test**
- **Estimation of Hiv, HbsAg, Hcv**
- **Demonstration of E. histolytica, Ascaris, Plasmodium**
- **W. bancrofti, V. cholera, Ancylostoma**

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 3) Histopathology and Cytology (Theory)**  
**Credits – 06**

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**Unit-1.** Introduction to HISTOPATHOLOGY: 1. Introduction to Histopathology: 2. Structure and functions of normal cell 3. Reception of specimens 4. Various fixatives – Mode of action, Indications, Preparation. 5. Grossing techniques 6. Steps of tissue processing and embedding. Fixation of Histology Samples: Principles, Methods and Types of Fixatives Aims of Fixation Ideal Fixative Tissue Changes in Fixation Types of Fixation Description of Nature of Fixation Essential Precautions for Fixation in General Mechanism of Fixation Factors Affecting Fixation Commonly Used Fixatives in the Laboratory Formaldehyde Preparation of Different Formalin Solution Glutaraldehyde Osmium Tetroxide Methyl and Ethyl Alcohol Acetone Bouin's Fixative Mercury Salt-Containing Fixatives Zenker's Fluid Helly's Fluid Fixatives Fixatives of Choice Fixation Artefact

**Unit-2.** **Diseases associated with coagulation disorders—** etiology & characteristics feature Normal Haemostasis Coagulation Cascade- fibrinolytic System Classification of Bleeding disorders Approach to Bleeding disorders Causes of thrombocytopenia ITP Hereditary disorder of platelet functions Coagulation disorders- classifications VWD, & Haemophilia DIC Definition & classification hyper coagulable states Antiphospholipid Ab Syndrome BT, CT, Clot retraction time, Hesstest PT/INR, APTT Fibrinogen Assay

**Unit-3. Processing of Tissue in Histopathology Laboratory** Factors that Influence Tissue Processing Dehydration Individual Dehydrating Agent Alcohol Dehydrating Agents Other than Alcohol Clearing Individual Clearing Agent Other Clear Agents Infiltration and Embedding Different Impregnating Medium Tissue Processing Methods Overall Precautions of Tissue Processing Time Schedule for Overnight Processing Manual Tissue Processor Microwave Processing **Embedding of Tissue in Histopathology** Embedding Medium Different Types of Mould Used for Block Tissue Embedding Method Tissue Orientation and Embedding Tissue Marking **Decalcification of Bony and Hard Tissue for Histopathology Processing** Introduction Factors Controlling the Rate of Decalcification The Methods of Decalcification Chelating Agents Other Procedures of Decalcification Surface Decalcification End Point Determination of Decalcification

**Unit-4. Tissue Microtomy: Principle and Procedure** Introduction Microtomes Microtome Knife Disposable Knife Materials Used in Knife Angles of Knife Microtome Knife Sharpening Manual Method Factors Involved in Cutting Sectioning the Paraffin Block Steps of Tissue Sectioning **Frozen Section: Principle and Procedure** Indications of Frozen Sections The Principle of Frozen Section Cryostat Sectioning Staining H&E Staining Toluidine Blue Stain Factors Affecting the Good-Quality

**Unit-5. Staining Principle and General Procedure: Staining of the Tissue** Dyes Used for Staining Types of Dye Types of Dye Based on Chemical Structures and Chromophore Groups Mechanisms and Theory of Staining Factors Influencing Staining Nomenclature Used Regarding Dye Metachromasia Metachromatic Dyes Progressive and Regressive Staining Mordant Accentuators Staining Procedure Preparation of Buffer Solutions **Haematoxylin and Eosin Stain of the Tissue Section** Introduction Haematoxylin Bluing Preparation of Different Haematoxylin and Their Properties Mayer's Haematoxylin Ehrlich's Haematoxylin Cole's Haematoxylin Counterstain by Eosin Routine Haematoxylin and Eosin Stain Iron Haematoxylin Heidenhain's Iron Haematoxylin Verhoeff's Iron Haematoxylin Tungsten

Haematoxylin Clearing of the Smear Mounting Coverslip **Special Stains for the Carbohydrate, Protein, Lipid, Nucleic Acid and Pigments** Carbohydrates Simple Carbohydrates Staining of Different Carbohydrates Glycogen Combined PAS-Alcian Blue Staining Lipids Stains Oil Red O Sudan Black B Ferric Haematoxylin for Phospholipid Nucleic Acid and Proteins Feulgen Stain Methyl Green-Pyronin Stain Pigments Hemosiderin Pigment Prussian Blue Reaction (Perls' Reaction) for Ferric Iron Bile Pigment Fouchet's Stain Argyrophil Pigments Grimelius Staining Melanin Schmorl's Stain Calcium Formalin Pigment **Connective Tissue Stain: Principle and Procedure** Fibrous Part of Connective Tissue Collagen Reticulin Fibres Elastic Fibres Basement Membrane Stains Masson Trichrome Van Gieson Stain Reticulin Stain Gordon and Sweet's Method for Reticulin Stain Elastic Fibres Verhoeff's Stain for Collagen Weigert's Resorcin-Fuchsin Stain Orcein for Elastic Fibres Phosphotungstic Acid Haematoxylin (PTAH) **Amyloid Staining** Stains for Amyloid Alkaline Congo Red Stain Congo Red Stain by Highman Thioflavine T Stain **Stains for the Microbial Organisms** Bacteria Gram's Stain Ziehl-Neelsen Stain Fite Acid-Fast Stain for Leprosy Fungal Infection Grocott's Methenamine Silver Spirochaetes Warthin and Starry Technique Viral Inclusions Phloxine-Tartrazine Stain.

**Unit-6. Basic Laboratory Techniques in Cytology Laboratory Cytology Sample Procurement, Fixation and Processing** Sample Collection Cervical Cytology Respiratory Samples Fixation Special Fixatives Processing of Laboratory Samples Receiving the Sample Glass Slides and Liquid Sample Processing Processing of Sputum Processing of Fluid: Urine, Body Fluids and Lavage Millipore Filtration Processing of Haemorrhagic Fluid Cell Block Compact Cell Block Technique **Routine Staining in Cytology Laboratory** Papanicolaou's Stain Dyes Used in Papanicolaou's Staining Principle of Basic Steps Papanicolaou's Staining Steps Bluing Solution Precautions to Be Taken in Papanicolaou's Staining May Grunwald Giemsa Stain **Basic Technique of Fine Needle Aspiration Cytology** Technique Proper Fine Needle Aspiration Procedure Fine Needle Sampling FNAC of Deep-Seated Lesions USG-Guided FNAC CT-Guided FNAC Endoscopic Ultrasound-Guided FNAC (EUS-FNAC) Complications of Guided FNAC Transrectal FNAC of the Prostate.

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 3) Histopathology and Cytology ( Practical)**  
**Credits - 02**

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- Grossing
- Tissue processing
- Embedding
- Tissue microtomy
- Staining
- Frozen section
- Histopathological Exercises:- Special Stains: Mucicarmin. P.A.S. Sudan Black. Oil Red 'O' Schmorl's reaction. DOPA Alcian Blue Congo Red Verhoeff's stain for Elastic tissue. Mallory's phosphotungstic Acid Hematoxylin stain (PTAH) Connective tissue stains. Van Gieson stain) Masson's Trichrome Technique Luxol Fast Blue Stain. AFB Staining -(for tissue sections of Tuberculosis and Leprosy) HISTOPATHOLOGY: Processing, Embedding, preparation of blocks, Section cutting, use and care of Microtome and Microtome knives and H & E staining. CYTOLOGY: Preparation of reagents, Wet film preparation, Fixation, staining (H&E, 'Pap', MGG and Shorr) of vaginal smears, cervical smears and sputum. FNAC (Fine Needle Aspiration Cytology) - preparation of smears and staining.

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 4) Biostatistics & Research Methodology (Theory)**  
**Credits – 06**

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- Unit 1.** Introduction to Biostatistics & research methodology, types of variables & scales of measurements, measures of central tendency and dispersion, rate, rate, ratio, proportion, incidence & prevalence.
- Unit 2.** Sampling Random & non-random sampling, various methods of sampling-simple random, stratified, systematic, cluster and multistage. Sampling and non-sampling errors & methods of minimizing these errors. Basic probability distributions and sampling distributions Concept of probability distribution. Normal, Poisson and Binomial distributions, parameters and applications. Concept of sampling distributions. Standard error and confidence intervals. Skewness and Kurtosis.
- Unit 3.** Tests of significance Basics of testing of hypothesis-Null and alternate hypothesis, type I and type II errors, level of significance (parametric) and power of the test, p value. Tests of significance –t-test (paired & unpaired), Chi square test and test of proportion, one-way analysis of variance. Repeated measures analysis of variance. Repeated measures analysis of variance. Tests of significance (non parametric) – Mann-Whitney u test, Wilcoxon test, Kruskal-Wallis analysis of variance. Friedmann’s analysis of variance.
- Unit 4.** Correlation and Regression Simple correlation-Pearson’s and Spearman’s; testing the significance of correlation coefficient linear and multiple regression. Multivariate analysis Concept of multivariate analysis, introduction to logistic regression and survival analysis.
- Unit 5.** Sample size determination General concept. Sample size for estimating means and proportion, testing of difference in means and proportions of two groups. Study designs Descriptive epidemiological methods- case series analysis and prevalence studies. Analytical epidemiological methods- case control and cohort studies. Clinical trials/intervention studies, odds ratio and relative risk, stratified analysis.
- Unit 6.** Format of scientific documents Structure of research protocol, structure of thesis/research report, formats of reporting in scientific journals. Systematic review and meta analysis.

**M. Voc. (Medical Laboratory Technology)**  
**SEMESTER-II**  
**(Paper - 4) Biostatistics & Research Methodology (Lab)**  
**Credits - 02**

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