## Medical Laboratory Sciences Laboratories

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BIOCHEMISTRY LABORATORY

INTRODUCTION
This Laboratory introduces students to basic experiments and techniques used in the biochemistry Laboratory. Initially, emphasis is placed on the buffer concept and preparation. The principle of kinetic analysis of enzymes is covered with experiments to show the effect of pH, temperature, and substrate concentrations on the activities of enzymes. Experiments on carbohydrates, lipids and vitamins are also conducted.

EQUIPMENT
• Spectrophotometers
• pH Meters
• Centrifuges
• Electrophoresis Complete System
• Automatic Pipettes
• Analytical Balance
• Water Bath
• Balances
• Glassware and Test Tubes
• Refrigerator

EXPERIMENTS
• Basic Calculations, Dilution, and Spectrophotometric Concepts, Components, and Utilization (2 Sessions)
• Determination of Unknown Concentration Using Spectrophotometer
• Buffer Preparation and Titration of a Weak Acid with Strong Base
• Effect of PH on the Salivary Amylase Activity
• Effect of the Substrate Concentration Upon the Rate, Velocity, of an Enzymatic Reaction
• Determination of the Iodine Number of Fat
• Estimation of Blood Cholesterol
• Determination of Vitamin C in Various Fruit Drinks
• Identification & Determination of Carbohydrates (Monosaccharides, Disaccharides & Polysaccharides)

TEST SERVICES
The test services available in this Laboratory are research-based services that utilize state-of-the-art machines and equipment.
INTRODUCTION
This Laboratory is designed to introduce the student to the laboratory safety rules, scientific method, microscopy, cell chemistry and basic laboratory studies of structure, function and interactions of living organisms including cells, tissues and organ systems. In addition to the principle of DNA structure, genetics and heredity.

EQUIPMENT AND INSTRUMENTS
• Compound Light Microscopes
• Stereomicroscope Microscopes
• Prepared Microscope Slides
• Human Body Models (Skeleton, Torso, Human Body Systems...etc.)
• Charts (Body Systems)
• Hematocrit Centrifuges and Readers
• Teaching Microscope (with Monitor)
• Teaching Microscope (with 10 Terminals)
• Phlebotomy Trolley (Station)
• Deep Freezer (-80 Deg. Centigrade)

EXPERIMENTS
• Introduction to Laboratory Safety, Orientation, Laboratory Basic Instruments and Tools, Metric System, the Scientific Experimental Method, and Temperature Conversion
• Identifying Parts of the Light and Stereo Microscopes, Focusing, Preparing Wet Mounts, and Prepared Slides Observation
• Chemical Composition of Cells
• Human Body Tissues: Classification & Identification of Epithelial, Connective, Muscular, and Nervous Tissues
• Systemic Homeostasis
• Hematocrit & Blood Grouping
• Mitosis: Stages of Mitosis in Onion Root Tips
• Meiosis: Stages of Oogenesis & Spermatogenesis (Prepared Slides)
• Simple Ouchtelony Test
• Auscultation of Heart Sounds and Measurement of Blood Pressure
INTRODUCTION
This Laboratory introduces students to basic techniques and procedures used in blood banking. Emphasis is placed on quality control and quality assurance to make sure that donor blood is compatible with the recipient blood. Tests include ABO grouping and Rh typing, compatibility and cross matching, antibody screening and antibody identification, and the Coombs Test.

EQUIPMENT AND REAGENTS
- Automated Blood Group System (ID- Centrifuge 24 S)
- Incubator 37°C (ID-Incubator 37 S II)
- ABO/D+ Reverse Grouping Cards
- Microscopes
- Centrifuges
- Rh View Box
- Blood Banking Reagents
- Refrigerator

EXPERIMENTS
- Preparation of Normal Saline and 2-5% Cell Suspension Washed RBC Cells
- Preparation of Check Cells
- Test Tube Determination of ABO Grouping, Both Forward and Reverse
- Determination of Rh Typing Including Du
- Performing Crosshatching and Compatibility Testing
- Performing the Antibody Screening Test
- Determining Antibody Titer and Score
- Combs’ Test, Both Direct and Indirect
- Determination of Secretor Status

TESTS AND SERVICES
- ABO Grouping
- Rh Typing
- Cross Matching and Compatibility
- Antibody Screening and Antibody Identification
- Antibody Titer and Score
- Combs’ Tests (Direct & Indirect)
INTRODUCTION
This Laboratory introduces students to the manual procedures and techniques commonly conducted in the clinical chemistry Laboratory. Clinical significance and interpretation of lab results is highly emphasized. Investigations included in this lab are the liver function test, kidney function test, lipid profile, carbohydrate metabolism, and endocrine function tests. Experiments cover subjects in both Clinical Chemistry 1 and 2.

EQUIPMENT
• Spectrophotometers
• Semi-Automated Chemistry Analyzer
• Centrifuges
• Automatic Pipettes
• Chemical Reagents and Kits
• Complete Electrophoresis System
• Densitometer
• Refrigerator

EXPERIMENTS
• Determination of Uric Acid and Creatinine in Serum and Urine
• Determination of Fasting Blood Sugar
• Kinetic Measurement of Lipase and or Alpha Amylase
• Kinetic Determination of Creatine Kinase
• Determination of Total Bilirubin, Conjugated and Unconjugated Bilirubin
• Determination of Albumin and Total Protein in Plasma
• Kinetic Determination of Alanine Aminotransferase
• Determination of Total Cholesterol
• Determination of HDL- Cholesterol and Calculation of HDL- Cholesterol
• Colorimetric Determination of Chloride in Serum
• Determination of Iron and TIBC
• Determination of Zink
TESTS AND SERVICES

- Liver Function Tests (AST, ALT, Bilirubin, etc...)
- Kidney Function Tests (Uric Acid, and Creatinine, Urea)
- Cardiac Enzymes (CPK, AST)
- Iron and TIBC
- Blood Sugar
- Albumin, Total Protein and More
INTRODUCTION
This Laboratory introduces students to various techniques and procedures used in the isolation and identification of infectious agents of human diseases including pathogenic bacteria, fungi, parasites and viruses according to body systems. General investigations will be carried out for urine, stool and body fluids (i.e. spinal, synovial, pleural, pericardial, abdominal, and seminal fluids).

EQUIPMENT AND INSTRUMENTS
• Incubators
• Autoclaves
• Anaerobic Jars
• Spectrophotometers
• pH Meters
• Ovens
• Colony Counters
• Balances

EXPERIMENTS
• Collection and Proper Preparation of Routine Specimens for Testing
• Preparation, Sterilization, Labeling and Storing Culture Media and Reagents used in Clinical Microbiology Lab
• Biochemical Testing to Identify Bacteria
• Examination of Sputum
• Examination of Fecal and Urine Specimens

TESTS AND SERVICES
• Isolation and Identification of Infectious Agents of Human Diseases
• General Investigations for Urine, Stool & Body Fluids
HEMATOLOGY LABORATORY

INTRODUCTION
This Laboratory introduces students to the basic techniques used in the evaluation and investigation of blood disorders. Manual and automated procedures are conducted in this Laboratory. Students perform manual and automated CBC, which includes the red blood cell count, white blood cell count, and platelet count. Students are also exposed and trained to identify normal and abnormal disorders related to red cells and white blood cells. The homeostatic part of this course deals with the assessment of the clotting factors and the concept and measurement of PT, PTT, fibrinogen and D-Dimer. Experiments conducted in this Laboratory cover the subjects Hematology 1 and Hematology 2.

EQUIPMENT
- Automated Cell Analyzer
- Cell Analyzer CA5309
- 10 terminals Teaching Microscope
- Microscopes
- Hemocytometers
- Hematocrit Centrifuges
- Centrifuges
- Semi-Automated Coagulation Machine
- Refrigerators

EXPERIMENTS
- Manual White Blood Cell Count
- Manual Red Blood Cell Count
- Manual Determination of Hematocrit and ESR
- Measurement of CBC using Fully Automated Cell Counter
- Preparing and Staining Peripheral Blood Smears
- Supra-Vital Staining for Reticulocytes
- RBC and WBC Morphology, Normal and Abnormal
• Osmotic Fragility Test and G6PD
• Sickle Cell Screening
• Determination of Prothrombin Time
• Determination of Partial Thromboplastin Time and D-Dimer
• Bleeding Time

TESTS AND SERVICES
• Complete Blood Count (CBC) and Differential Count (Manual and Automated)
• Manual Hematocrit
• Erythrocyte Sedimentation Rate
• Reticulocyte Count
• PT, PTT, D-Dimer
INTRODUCTION
This Laboratory includes a thorough grounding in all aspects of histopathological techniques such as tissue fixation, grossing and preparation, processing, embedding, microtome section cutting, staining and microscopic examination of tissue samples. Other techniques including frozen sections and bone decalcifications are demonstrated.

EQUIPMENT AND INSTRUMENTS
- Automatic Tissue Processor
- Tissue Embedding Station (Histocenter)
- Rotary Microtome
- Section Floating-Out Bath
- Tissue Block Storage Cabinets
- Cryostat
- Binocular Microscopes
- Demonstration Microscope With Large LCD Screen
- Base-Sledge Microtome
- Dissection, Fixation, and Staining Tools
- Automatic Knife Sharpener
- Centrifuges
- Refrigerators
- Freezers

EXPERIMENTS
- Sample Collection (Rabbit Dissection)
- Fixation, Grossing and Sample Accession
- Manual Tissue Processing
- Paraffin Embedding and using the Tissue Center/Station
- Automatic Tissue Processing
- Microtomy - Introduction to the Instrument
• Microtomy - Practical Section Cutting
• Cryostat, Frozen and Related Sections
• Hematoxylin and Eosin Staining, Mounting and Cover Slipping
• Bone Decalcification and Processing

TESTS AND SERVICES
• Histological Techniques of Fixation, Grossing, Processing (Dehydration, Clearing, Impregnation), Embedding, Section Cutting (Microtomy) and Staining Procedures
INTRODUCTION
Students are exposed to the gross anatomy and practicing different techniques of the functions of different systems of the human body, like blood cells counting, ECG, respiratory function tests...etc.

EQUIPMENT AND INSTRUMENTS
- Microscopes
- Autoclave
- Ice Maker
- Spirometers (Automated and Manual)
- Kymographs
- ECG Machines
- Stethoscopes and Sphygmomanometers
- Stop Watches
- Human Body Models and Charts (Heart, Body Systems, Torso, etc.)
- Exercise Bicycles
- Tuning Forks & Mallets
- Visual Testing Charts
- Snellen Charts
- Ophthalmoscopes
- Flash Lights
- Water Bath
- Fume Hoods
- Dissecting Sets
- Plastinated Models (of Human Organs)
- Physiograph
- Refrigerator
EXPERIMENTS

- Orientation & Lab Safety
- Neuron Anatomy & Physiology
- The Special Senses: The Eye Anatomy & Visual Tests
- The Special Senses: Ear Structure and Hearing Tests
- The Cardiovascular System: Heart Anatomy, Blood Pressure & Pulse
- The Cardiovascular System: Cardiac Cycle & Electrocardiograph (ECG)
- Anatomy of the Respiratory System, Respiratory System Physiology – Spirolab
- Functional Anatomy of the Digestive System: Enzymes Activity
- The Urinary System: Anatomy and Urinalysis
- The Endocrine System: Functions, and Blood Glucose Testing
INTRODUCTION
This Laboratory studies the immune response of an individual to an infection or a foreign substance (antigen). This Laboratory serves two diagnostic purposes: First, it helps in the diagnosis of several bacteria, fungal, viral and parasitic infections; and second, it assesses the immune status of the patient. A serum sample, the blood fluid that remains when the blood clots, is usually used in such testing, hence labeling the Laboratory the Serology Laboratory. Further, serologic testing can be performed on other specimens such as a bacterial culture. Due to major developments in the field, a significant number of kits have become available in the market making this testing process an easy and accurate one.

EQUIPMENT AND INSTRUMENTS
• Incubators and Water Baths
• Microscopes
• Enzyme Immunoassay Washer and Reader Station (for ELISA Testing)
• Fluorescent Microscope
• Chemical Reagents and Buffers
• Serology Kits

EXPERIMENTS
• Anti-Microbial Immunity. Investigation into the Effects of lysozyme
• Acute Phase Reactants. Latex Agglutination Test for C - Reactive Protein
• Precipitation and Agglutination Based Tests
• Labeled Immunoassays such as Enzyme Linked Immunosorbent Assay (ELISA)

TESTS AND SERVICES
• Microbial Testing such as Anti-Streptolysin O (ASO), E.coli 0157, Widal etc.
• RPR, Syphilis Test
• Infectious Mononucleosis Testing
• Antibody Profile
• Hepatitis B Testing
• Immunodiffusion Fungal Testing
• Anti-Nuclear Factor for SLE Testing
• Pregnancy Testing

In addition to many other serological tests.
INTRODUCTION
Practical sessions cover methods of isolation and identification of pathogenic bacteria that cause human disease by using rich, selective and differential culture media. Other biochemical and serological methods for diagnosis are also used.

EQUIPMENT AND INSTRUMENTS
- Autoclaves
- Anaerobic Jars
- Spectrophotometers
- PH Meters, Centrifuges
- Oven
- Water Bath
- Balance
- Refrigerators and Freezers
- Culture Media, Diagnostic Kits, and Reagents
- Microscopes
- Colony Counters

EXPERIMENTS
- Grow Bacterial Cultures on Appropriate Media and Discuss the Significance of Quality Control in a Microbiology Lab
- Morphology of Microorganisms: Wet Mount Preparation, Smear Preparation, and Simple Staining
- Differential Staining: Gram Stain, Acid-Fast Stain and Capsular Stain
- Staphylococcus, Streptococcus, Enterococcus and Pneumococcus Identification
- Enterobacteriaceae Identification
- Pseudomonas and other Aerobic Bacilli Identification
- Antimicrobial Sensitivity Testing

TESTS AND SERVICES
- Isolation and Lab Diagnosis of Pathogenic Bacteria
- Antibiotic Sensitivity and MIC for Bacteria
- Laboratory Diagnosis of Different Types of Bacteria by using Various Bacteriological, Serological and Biochemical Methods to Diagnose Pathogenic Bacteria
MOLECULAR GENETICS LABORATORY

INTRODUCTION
Experiments are designed for students to be familiar with calculations, micro pipetting, reagent preparation, biological safety methods, advanced techniques like DNA, RNA Electrophoresis from human blood samples, plasmid DNA isolation, competent cells preparation, PCR amplification etc.
This course provides the students with basic biological lab safety knowledge and advanced micro techniques, and how to handle biological samples, set up molecular biology experiments, basic trouble shooting and interpretation of results.

EQUIPMENT
• Autoclave
• Centrifuges
• Balances
• Micropipettes
• Water Bath
• UV Trans Illuminator
• Electrophoresis Apparatus
• Microwave Oven

EXPERIMENTS
• Calibration
• Preparing Laboratory Solutions
• DNA Extraction from Whole Blood
• DNA Purification & Gel Preparation and Electrophoresis
• Preparation and Transformation of Competent Cells
• Plasmid Isolation
• Use of Restriction Enzymes
• Action of Ligase
• RNA Extraction from Whole Blood
• Polymerase Chain Reaction (PCR)
• Southern Blot

TESTS AND SERVICES
• Isolation of DNA and RNA from Various Tissues
• Production of cDNA Mutagenesis of Cloned Genes
• Specific Gene Detection using PCR Technique and Cloning
INTRODUCTION
Laboratory sessions are designed to expose students to the morphology of different diagnostic stages of medically important parasites and introduce the skills for proper lab procedures for collection, handling and identification of most common protozoal and worm infections.

EQUIPMENT AND INSTRUMENTS
- Microscopes
- Prepared Parasitology Slides
- Centrifuges
- Test Tubes
- Glassware
- Slides and Cover Slips
- Charts and Models

EXPERIMENTS
- Quality Assurance, Artifacts Routinely Found in Parasitology Specimens, Collection of Specimens and Types of Potential Sources of Errors in Laboratory Procedures
- Microscopic Identification of Flagellated Protozoa: Trypanosoma Brucei Rhodesiense, Trypanosoma Brucei Gambiense, Trypanosoma Cruzi, Leishmania Species, Giardia Lamblia, Trichomonas Vaginalis and Non-Pathogenic Trichomonads
- Concentration Techniques for Recovery of Intestinal Parasites. Sarcodina: Entamoeba Histolytica, E. coli, E. Hartmanni, Iodamoeba Butschlii, Endolimax Nana
- Preparation of Thin and Thick Blood Films. Giemsa Staining Technique for Blood Smears
- Identification of Malaria Parasites in Stained Blood Smears
- Identification of Different Eggs and Larval Atages of Medically Important Worms

TESTS AND SERVICES
- Macroscopic & Microscopic Fecal Examination for Detection of Eggs and Cysts of Parasites of the Digestive Tract
- Concentration Techniques for Parasites
- Blood Smear to Detect Blood Parasites
INTRODUCTION
This Laboratory offers students the necessary theoretical and practical training to perform proper venous and micro capillary blood collection, solve common phlebotomy complications and understand the phlebotomist’s role as an effective member of the healthcare team. In addition, safety and infection control measures, quality assurance and total quality improvement, and ethical standards and professional conduct are introduced.

EQUIPMENT AND TOOLS
- Hematocrit Centrifuges
- Vacutainer Systems
- Syringe System
- Butterfly System
- Glass Slides
- Tourniquets
- Puncture Proof Containers
- Biohazard Bags
- Disposable Gloves
- Auto-Lancets

EXPERIMENTS
- Specimen Handling & Labeling
- Performing Blood Drawing using the Venipuncture Method
- Performing Blood Drawing using the Syringe Method
- Performing Capillary Puncture Techniques

TESTS AND SERVICES
- Phlebotomy Services
- Phlebotomy Training
INTRODUCTION
This Laboratory exposes and trains students on the most commonly performed body fluids tests including Urine, CSF, Synovial fluid and others. Routine and special tests are emphasized in this laboratory. Students perform complete urinalysis and examine urine sediments and identify all abnormal findings such as crystals, WBC, RBC, bacteria, parasites, and urine casts.

EQUIPMENT
• Centrifuges
• Reagent Test Strips
• Blank Glass Slides, Disposable Pipettes, and Cover Slips
• Disposable Gloves, Tubes, and Containers
• Siemens Multistix 10 SG Urinalysis Machine

EXPERIMENTS
• Physical Examination of Urine: Color, Appearance, and Specific Gravity
• Chemical Examination of Urine: pH, Protein, Sugar, Ketone, Bilirubin, Bacteria
• Microscopic Examination of Urine sediment and identification of Blood cells, Crystals, Parasites, Yeast, Bacteria, and Casts
• Screening for Ascorbic Acid
• Screening for Phenylketonuria
• Screening for Aminoaciduria
• Investigation of Other Body Fluids: CSF, Synovial Fluid, Peritoneal Fluid

TESTS AND SERVICES
• Urinalysis, Microscopic and Macroscopic
INTRODUCTION
The objectives of this Laboratory are to conduct research projects for students and faculty members, achieve scientific outcomes, improve the quality of research, acquire a variety of advanced equipment related to research, attract significant funding for research projects and encourage collaborative scientific research among experts and researchers.

MISSION
• To expand the horizon of scientific knowledge through extensive and profound research.
• To advance University research, education, and training in the field of Molecular Genetics as well as other different scientific disciplines.
• To promote and enhance the quality and innovative nature of scientific research, where outcomes reflect well on the academic community and lead to more accomplishments.

EQUIPMENT AND INSTRUMENTS
• Thermo Cyclers for PCR
• UV Light Documentation System
• Centrifuges
• Gel Electrophoresis
• Trans-Illuminator
• Thermo Shaker