NIMS UNIVERSITY

SYLLABUS

OF

DIPLOMA IN MEDICAL LAB TECHNOLOGY – DMLT12

VERSION 1.2

DIRECTORATE OF DISTANCE EDUCATION

Shobha Nagar, Jaipur-Delhi Highway (NH-11C), Jaipur- 303121
Rajasthan, India

DIPLOMA IN MEDICAL LAB TECHNOLOGY – DMLT12

Eligibility	:	Senior Secondary Level Examination
Programme Duration	:	2 Years
Programme Objectives	:	Medical Laboratory Technology, also known as Clinical laboratory science, is an allied health/paramedical profession, which is concerned with the diagnosis, treatment and prevention of disease through the use of clinical laboratory tests. Doctors rely on laboratory technologies to detect, diagnose and treat diseases. The programme covers the basics of preclinical subjects such as Biochemistry, Pathology, Microbiology and Blood Banking. Medical Laboratory Technologists (MLT) do these tests by analyzing body fluids, tissues, blood typing, microorganism screening, chemical analyses, cell counts of human body etc.
Job Prospects	:	After the completion of DMLT, you will find a challenging career in a hospital, minor emergency centers, private laboratory, blood donor centers, doctor's office or clinics. A technician can become a technologist through further education and work experience. Common job profiles of students after completing DMLT include: Technician in Blood Banks, Hospitals, Nursing Homes and Diagnostic Labs

YEAR I

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
CSC13107	Fundamentals of Computer Science	70	30	2
ANT13102	Human Anatomy & Physiology-I	70	30	5
BCH13101	Biochemistry-I	70	30	3
BBN13101	Pathology & Blood Banking	70	30	3
MBL13101	Microbiology-I	70	30	3
BCH13101P	Biochemistry-I	35	15	2
BBN13101P	Pathology & Blood Banking	35	15	2
MBL13101P	Microbiology-I	35	15	2
TRN13101	Hospital Training-I	200		2
			TOTAL	24

YEAR II

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
WCM13201	Environmental & Bio Medical Waste Management	70	30	3
ANT13201	Human Anatomy & Physiology-II	70	30	3
BCH13201	Biochemistry-II	70	30	4
PAT13201	Pathology	70	30	4
MBL13201	Microbiology-II	70	30	4
BCH13201P	Biochemistry-II	35	15	2
PAT13201P	Pathology	35	15	2
MBL13201P	Microbiology-II	35	15	2
TRN13201P	Hospital Training-II	200		2
			TOTAL	26

DETAILED SYLLABUS

INSTRUCTIONAL METHOD: Personal contact programmes, Lectures (virtual and in-person), Assignments, Labs and Discussions, Learning projects, Industrial Training Programmes and Dissertation.

YEAR I

FUNDAMENTALS OF COMPUTER SCIENCE- CSC13107

UNIT	CONTENTS
1.	**Computer Application:** Characteristic of Computers, Input, Output, Storage Units, CPU, Computers System.
2.	**Computers Organization:** Central Processing Unit, Control Unit, Arithmetic Unit, Instruction Set, Register, Processor Speed.
3.	**Memory:** Main Memory, Storage Evaluation Criteria, Memory Organization, Memory Capacity, Random Access Memories, Read Only Memory, Secondary Storage Devices, Magnetic Disk, Floppy and Hard Disk, Optical Disks CD-ROM, Mass Storages Devices.
4.	**Input Devices:** Keyboard, Mouse, Trackball, Joystick, Scanner, Optical Mark Reader, Bar-code reader, Magnetic ink character reader, Digitizer, Card reader, Voice recognition, Web cam, Video Cameras.
5.	**Output Devices:** Monitors, Printers, Dot Matrix Printers, Inkjet Printers, Laser Printers, Plotters, Computers Output Micro Files (Com), Multimedia Projector.
6.	**Operating System:** Microsoft Windows, An overview of different versions of Windows, Basic Windows elements, File managements through Windows. **Using Essential Accessories-** System tools, Disk cleanup, Disk defragmenter, Entertainments, Games, Calculator, Imagine-Fax, Notepad, paint, Word Pad, Recycle bin, windows Explorer, Creating folders icons.
7.	**Word Processing:** Word processing concepts, Saving, Closing and opening existing documents, Selecting text, Editing text, Finding and replacing text, Printing documents, Creating and printing merged documents, Mail merge, Character and paragraph formatting, Page designs and layout, Editing and proofing tools checking and correcting spellings, Handling graphics, Creating tables and charts, Documents templates and wizards.
8.	**Presentation Package:** Creating opening and saving presentations, Creating the look of your presentation, Working in different views working with slides, Adding and formatting text, Formatting paragraphs, Checking spelling and correcting typing mistakes, Making notes pages and handouts, Drawing and working with objectives, Adding clip art and other pictures, Designing slides shows, Running and controlling a slid show, Printing Presentations.

9.	**E-Mail and Internet:** Use of Internet and Email, Internet, Websites (Internet Sites), The Mail protocol suite.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Computer science fundamentals: an algorithmic approach via structured programming by Elizabeth A. Unger, Nasir Ahmed

B. Computer Fundamentals by Pradeep Sinha, Priti Sinha Bpb Publications (2003)

HUMAN ANATOMY & PHYSIOLOGY-I- ANT13102

UNIT	CONTENTS
1	**Human Body and the Integumentary System:** Anatomy – Meaning and Types Anatomical Positions and Planes Terms to describe locations Homeostasis Classification of humans Levels of Structural Organization Overview of Organ Systems Integumentary System - Skin and its appendages Structure of the Skin Appendages of the Skin
2	**The Skeleto-Muscular System:** Classification of Bones Bone Tissues Skeleton and Structure of Human Bones Bone Joints Movements in Human Body Muscular System and Muscle Tissues
3	**The Nervous System:** General Organization of the Nervous System Histology of Neural Tissue Neuron Structure and Classification of Neurons The Brain The Spinal Cord Autonomic Nervous System
4	**The Endocrine System:** Major Endocrine Organs Hormones of the glands and their function- Hormones of anterior pituitary Hormones of the Posterior Pituitary Adrenal Glands-

	Hormones of the Adrenal Medulla Hormones of the Pancreatic Islets Hormones of the Thyroid Gland Parathyroid Glands Sex hormones
5	**Introduction to Physiology:** Physiology - Meaning Homeostasis Cell Body Fluid Transport through cell membrane
6.	**Muscle Nerves:** Membrane Potential Action Potential Nerve Muscle Physiology- Structure of Neurons Classification of Neurons Conduction of Impulses in Neurons Muscles- Classification of Muscles Skeletal Muscle Myofibril Electrical Phenomenon & Ionic Fluxes Molecular Basis of Muscle Contraction Neuromuscular Junction
7	**Blood:** Blood - Properties and Composition Functions of Blood Plasma Protein- Components Forms Functions Haemoglobin- Structure Factors affecting Haemoglobin Physiological Types Derivatives Functions Haemoglobin Breakdown Blood Cells- Compositions and Functions of RBC Compositions and Functions of WBC Compositions and Functions of Platelets Haemopoiesis-

	Meaning Process Stages of Erythropoiesis Anemia - Types Haemostasis- Stages Blood Coagulation Haemorrhagic Disorders Blood Group- ABO Rh Importance Blood Transfusion Lymphoid Tissue and Immunity
8	**The Cardiovascular System:** Functions of Heart Passage of Blood through Heart Cardiac Muscle Cardiac Pacemaker and Conduction System Functions of the Cardiovascular System Cardiac Cycle Heart Sounds The Electrocardiogram (The ECG) Blood Pressure
9	**Respiratory System:** Organization of Respiratory System Respiratory Divisions Functions of Respiratory Tract Functions of Respiratory System- Pulmonary Ventilation Changing Alveolar Volumes Pulmonary Volumes Pulmonary Capacities Minutes of Alveolar Ventilation Transport of Gases- Physical Principles of Gas Exchange Respiratory membrane Oxygen and Carbon dioxide diffusion Gradients Oxygen Transport Carbon Dioxide Transport
10	**Digestive System:** Components of GIT Functions of Digestive System Innervations of GIT- Mouth (Oral Cavity)

	Salivary Glands Composition and Functions of Saliva Mastication (Chewing) Swallowing (Deglutition) Stomach- Composition & Functions of Gastric Juice Pancreas- Composition and Functions of Pancreatic Juice Regulation of Pancreatic Juice Secretion Gall - Bladder and Liver- Bile Liver Small and Large Intestine- Intestinal Juices (Succus Entericus) Movements of Small Intestine Large Intestine Digestion and Absorption- Digestion and Absorption of Carbohydrates Digestion and Absorption of Proteins Digestion and Absorption of Fats

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Text books of Physiology. Author: Guyton (Arthor C). Prism publishers Bangalore.

B. Human Physiology. Author : Chaterjee (cc). Medical allied agency

C. Concise Medical physiology. Author : Choudhary (Sujit km.). New central books Kolkata.

BIO CHEMISTRY-I- BCH13101

UNIT	CONTENTS
1	**Analytical Balance:** Analytical Balance— An Introduction Analytical Balance—Use and Maintenance
2	**Preparation of Solution Reagents:** Standard Solutions- Types and Use of Standard Solutions Expressing Concentration of Solutions Preparation of Standard Solutions Dilution of Solution Reagents—Formulation Storage and safe Use of Chemicals and Reagents-

	Flammable Chemicals Corrosive Chemicals Toxic, Harmful and Irritating Chemicals Oxidizing Chemicals Explosive Chemicals Carcinogens Strength Normality
3	**Biological Specimens:** Collection and recording of Biological specimens Separation of Serum and Plasma Preservation and Disposal of Biological Samples/materials
4	**Chemistry of Carbohydrate:** Carbohydrates Classification of Carbohydrates Function of Carbohydrates Properties of Carbohydrates Metabolism of Carbohydrate
5	**Proteins and Amino acids:** Meaning and definition of Proteins and Amino Acids Classification of Proteins and Amino Acids Function of Proteins Properties of Amino Acids
6	**Chemistry of Lipids:** Definitions of Lipids Classification of Lipids Function of Lipids

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Title Basic Concepts in Biochemistry: A Student's Survival Guide by Hiram Gilbert McGraw Hill Professional, 1999

B. Textbook of Biochemistry for Medical Students by Vasudevan DM, S Sreekumari JAYPEEDIGITAL

PATHOLOGY & BLOOD BANKING- BBN13101

UNIT	CONTENTS
1	**Introduction to Clinical Hematology:** Instruments and Glassware used in Pathological Laboratories Cleaning, Disinfection & Sterilization Preparation of Stains
2	**Method of Collection of Blood Samples:** Methods of Blood Sample Collection Anticoagulants used in tests and preservation Shelf life of Blood

3	**Blood Cells and Platelets:** Normal morphology Count Blood Count Platelet Morphology and Platelet Count Anemia –Meaning Types and Classification Characteristics and their feature Clinical investigation for Anemia
4	**Blood Composition:** Functions of Blood Haemostatis **Basic Hematological Techniques:** RBC count (Red blood cell count), HB estimation (hemoglobin estimation), WBC count Erythrocyte sedimentation rate, Reticulocyte count, Determination of bleeding time (BT), clotting time (CT), and prothrombin time (PT) Blood indices
5	**Preparation of Blood Films:** Stains used in Hematology Preparation of Buffy coat smears
6	**Laboratory Methods Used In the Investigation of Anemia:** RBC morphology & Normal and Abnormal hypochromia Vitamin B_{12} and folic acid Schilling test Serum iron and iron binding capacity Screening for sickle cell anemia
7	**Preparation of Smear For Diagnosis of Blood Parasites:** Laboratory investigations of blood parasites Test of L.E. cell.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Hand book of Blood Transfusion Therapy. Author: J.A.F. Napier. Publisher : John Wiley & Sons, Chichester, England

B. Blood Banking and Transfusion Medicine Basic Principles and practice. Author : Christopher D., Hill Yeretal. Publishers : Churchile Livingstone, Philadelphia.

C. Test book of Blood Transfusion Banking and Transfusion Medicine. Author : Sallyv. Rhdman. Publisher: W.B. Sauders Company, Philadelphia.

MICROBIOLOGY-I- MBL13101

UNIT	CONTENTS
1	**Introduction to Microbiology:** Microbiology- Definition and History Safety Measures in Microbiology Laboratory Care and Maintenance of Laboratory Equipments
2	**Morphology:** Structure of Bacteria Use of Microscope in the study of Bacteria
3	**Morphology of Bacteria:** Growth Requirements- Sources for Carbon and Energy Source of Nitrogen Source of Hydrogen and Oxygen Source of Calcium Source of Water Source of Minerals Environmental Factors affecting growth- The Effect of Oxygen The Effect of pH on Growth The Effect of Temperature on Growth Effect of Carbon Dioxide Effect of Osmotic Pressure Bacterial Growth- Bacterial Cell Division Generation Time Bacterial Growth Curve
4	**Sterilization and Disinfection:** Definitions Methods of Sterilization Physical methods of sterilization Sunlight Drying Heat Radiation Filtration Chemical methods of sterilization
5	**Immunology:** Immunity Innate Immunity Acquired Immunity Immunity vaccines and types Serological Tests - Principles and interpretations

	Widal Test VDRL Test ASLO Test CRP Test RF Test ELISA

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Microbiology: An Introduction, 9/E Tortora Publisher Pearson Education India, 2008

B. Essentials of Medical Microbiology by Bhatia Rajesh, Ichhpujani Rattan Lal-JAYPEEDIGITAL

BIO CHEMISTRY-I – BCH13101P

UNIT	CONTENTS
1	Practical I- Introduction to apparatus, Instruments and uses of chemical balance, Calculation of molecular weights and Equivalent weights. Preparation of solutions- Preparation of normal solution, Molar solutions, Percentage solution and reagents, Dilution techniques, Measurements of hydrogen ion concentration qualitative analysis, Identification of carbohydrates, Proteins and substances of biochemical importance. Demonstration of colorimeter, Spectrophotometer, Perimeter, Single pan balance Specimen- Specimen collection, Identification, Transport, Delivery and Preservation Patient preparation for tests. Disposal regulations, Workplace hazards.
2	Practical II- Anticoagulants and Preservatives Regulations and precautions regarding transport of biological specimens Preparation of high quality water, pH determination, Preparation of buffers and determination of pH Measurement of radioactivity Practical related to solvent extraction, Partition coefficient, Dialysis, Concentration, Desalting and ultracentrifugation Calibration of equipments and laboratory wares Photometry- Familiarization and usage of Colorimetry, Specterophotometry, Fluorimetry, Flame photometry, Atomic absorption spectroscopy, Nephelometry, Osmometry, Chemiluminesence ,ion selective electrodes, Flowcytometry Chromatography- Paper, Thin layer, Gel filtration, Ion exchange, HPLC, GLC, Separation of various sugars, Amino acids, Lipids, Drugs toxins etc. Urine aminogram.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Textbook of Practical Biochemistry By Joshi A. Rashmi

B. Principles & Techniques of Practical Biochemistry By Keith Wilson

PATHOLOGY & BLOOD BANKING – BBN13101P

UNIT	CONTENTS
1	Practical I- Pathology Laboratory- Aim, basis, Interpretation, Safety in clinical pathology laboratory, Laboratory organization. Instruments, Glassware's, Cleaning of glassware Sample collection and Specimen labeling Routine test, Anticoagulants, Reagents, Isotonic solution, Standardization methods. Preparation of solution and Interpretation of result, Normal values. Basic requirements for hematology laboratory Complete Blood Counts, Determination of Hemoglobin, TRBC Count by Hemocytometers, TLC by Hemocytometer.
2	Practical II- Differential Leukocyte count, Determination of Platelet count, Determination of ESR by wintrobes method , Determination of ESR by Westergerent's method, Determination of PCV by Wintrobes tube, Erythrocyte Indices – MCV, MCH, MCHC, Reticulocyte count, Absolute Eosinophil count, Morphology of Red Blood Cells, BT and CT, PT (prothrombin) time, Demonstration of (MP), Malaria Parasite.
3	Practical III- Bone marrow smears preparation and staining procedure – Demonstration, ABO Blood grouping, Rh typing and cross match, Performance of direct and indirect coombs test, Red cell agglutination test (screening Paul bunnel test), Blood donor selection and screening, Blood collection and preservation, Principle of clearing and preparing transfusion bottle and tubing sets – Preparation and Transfusion reaction and their investigations.
4	Practical IV- Blood Bank Administration, Record Keeping, Computerization in Blood Transfusion services, ABO Blood grouping, Rh typing various techniques, Cross Matching, Tube test, Slide Test, D^u Test, Sub Grouping Test, Coombs Test, Direct coombs test, Indirect coombs test, Compatibility Testing for blood transfusion cross matching test, 5% cell suspension and 10% cell suspensions, HIV and AIDS demonstration.
5	Practical V- Urine Routine examination normal / abnormal constituents of urine, C.S.F. and other body fluids examination, Semen Analysis, Sputum test, Different types of blood test, Stool Routine examination.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. The language of pathology: an introduction to medical terminology and the nature of disease by Glyndwr Walters

B. Mini Atlas Pathology: 2007 By Harsh Mohan-Jaypee Brothers

MICROBIOLOGY-I – MBL13101P

UNIT	CONTENTS
1	Practical I- Compound Microscope Demonstration and Sterilization of Equipments – Hot Air oven, Autoclave, Bacterial filters. Demonstration of commonly used Culture Media- Nutrient broth, Nutrient agar, Blood agar, Chacolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media, Potassium, Tellurite media with growth, Mac with LF & NLF, NA with staph.
2	Practical II- Antibiotic susceptibility test Demonstration of common serological tests – Widal, VRDL, ELISA, Grams staining, Acid Fast Staining Stool exam for Helminthic ova Visit to hospital for demonstration of Biomedical Waste Management Anaerobic Culture Methods.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf

B. Practical Microbiology by Vasanthakumari BI Publications Pvt Ltd, 2009

HOSPITAL TRAINING-I-TRN13101

YEAR II

ENVIRONMENTAL & BIO MEDICAL WASTE MANAGEMENT-WCM13201

UNIT	CONTENTS
1	**Environment Introduction:** Biotic and Abiotic environment, Adverse effects of Environmental Pollution, Control Strategies, Various Acts and Regulation.
2	**Water Pollution:** Water Quality Standards for potable water, Surface and underground water sources, Impurities in water and their removal, Denomination, Adverse effects of domestic waste water and industrial effluent to surface water sources, Eutrophication of lakes, Self purification of steams.
3	**Air Pollution:** Sources of air contaminations, Adverse effects on human health, Measurement of air quality

	standards and their permissible limits, Measure to check air pollution, Greenhouse effect, Global warming, Acid rain, Ozone depletion.
4	**Bio Medical Waste Management:** Introduction to Bio-Medical Waste, Types of Bio-Medical Waste, Collection of Bio-Medical Waste, Treatment and safe disposal of Bio-Medical Waste.
5	**Solid Waste Management:** Introduction to Solid Waste, Its collection and disposal, Recovery of resources, Sanitary land-filling, Vermin-composting, Hazardous waste management.
6	**Land Pollution:** Soil Conservation, Land Erosion, Aforestation, Ecology Business of Species, Biodiversity, Population Dynamics, Energy flow, Ecosystems
7	**Social Issues and the Environment:** Sustainable development and life style, Urban problems related to energy, Resettlement and rehabilitating of people, Environmental ethics, Consumerism and waste products, Water Harvesting and Rural Sanitation- Water harvesting techniques, Different schemes of Rural Water Supply in Rajasthan, Rural Sanitation, Septic Tank, Collection and disposal of wastes, Bio-gas, Community Awareness and participation, Miscellaneous, Non-Conventional (Renewable) sources of energy, Solar energy, Wind energy, Bio-mass energy, Hydrogen energy.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Paryavaran Shiksha. Author : Dr. A.N. Mathur, Dr. N.S. Rathore, Dr. V.K. Vijay.

B. Paryavaran Adhyayan. Author : Dr. Ram Kumar Gujar, Dr. B.C. Jat

C. Parayavaran Avabodh. Author : Dr. D.D. Ojha.

D. Environmental Chemistry and Pollution Control. Author : S.S. Dora

E. Ecology concepts and application. Author : Manuel C. Muller.

HUMAN ANATOMY & PHYSIOLOGY-II- ANT13201

UNIT	CONTENTS
1	**The Cardiovascular System:** Anatomy of Circulatory System Anatomy of the Heart and Blood Vessels Lymphatic System
2	**Respiratory System:** Anatomy of Respiratory System Gross Anatomy of the Lungs
3	**Digestive System:** Anatomy of Digestive System Gross Anatomy of Stomach Regions of Small Intestine Regions of Large Intestine

	Accessory Glands- Liver Gall Bladder Pancreas
4	**The Urogenital System:** Anatomy of Urinary System- Kidney Ureters Urinary Bladder Urethra Anatomy of Genital System- Male Genital System Female Genital System
5	**Nervous System:** Functions of Nervous System Three Ventricles- Functions of Brain The Cerebrum Limbic System Functions of Basal Ganglia Mesencephalon The Cerebellum Brain Stem- The Spinal cord Peripheral Nervous System- Somatic Nervous System Autonomic Nervous System Spinal Nerves Cranial Nerves Synapse and Receptor- Structure of a Synapse Classification of Synapse Synaptic Transmission Receptors- Classification of Sensory Receptors Sensory System Reflexes- Reflex Arc Function of Reflexes Classification of Reflexes Ascending and Descending Tracts of Spinal Cord- General Arrangement of both Tracts Ascending Tracts (Sensory) Somatosensory Cortex

	Descending Tracts (Motor) Cerebrospinal Fluid- Composition of fluid Formation of fluid Circulation CSF Pressure Hydrocephalous Functions of CSF Autonomic Nervous System (ANS) Organization of the ANS Sympathetic nervous system Parasympathetic Nervous System Functions of Autonomic Nervous System
6	**Special Senses:** Functions of Eye- The Wall of the Eyeball Vision Visual Pathways to the Central Cortex Refraction Errors of Refraction Colour Vision The Mechanism of Hearing Structure and Function of Ear- The External Ear The Middle Ear The Internal Ear Organ of Corti- The Receptor of Hearing
7	**The Integumentary System:** Functions of Skin Body Temperature- Regulation of body temperature Applied aspects
8	**The Excretory System:** Structure of Kidney The Nephrons- Types of Nephrons Functions of Kidney Juxtaglomerular Apparatus Renal Circulation Formation of Urine- Glomerular Filtration Tubular Reabsorption Tubular Secretion Micturition- Micturition Reflex

	Cystomterogram Diuretics Artificial Kidney
9	**The Reproductive System:** Male Reproductive System- Primary Sex Organs - Testis Functions of Testis Functions of Testosterone Accessory Sex Organs Female Reproductive System - Functions of Ovaries Accessory Sex Organs Female Sexual Cycle- The Ovarian Cycle The Menstrual Cycle Ovulation Tests Pregnancy Test Parturition and Lactation- Stages of Parturition Composition of Breast Milk Advantage of Breast Feeding Fertility Control-Contraceptive Methods

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Varley – Clinical Chemistry. Author : William heinemann. Publisher: Medical books Ltd. and inter science books in Newyork.

B. KALPLAN – Clinical Chemistry. Author: C.V. Mosoby Company. Publisher: St. Loie's Washington.

C. TEITZ – Clinical Chemistry. Author : William B. Publisher : Sainders Company Harcourt (India)

BIOCHEMISTRY-II- BCH13201

UNIT	CONTENTS
1	**Cells and Cell Organelles:** Prokaryotic Cells Eukaryotic Cells Cell Organelles and subcellular fractions Subcellular fractionation Markers of subcellular organelles
2	**Nucleic Acids:** Definitions of Nucleic Acids Types of Nucleic Acids Functions of Nucleic Acids
3	**Enzymes:** Properties and classification of Enzymes Coenzymes and their characteristics Factors influencing the rate of Enzymatic Reactions Effect of Enzyme Concentration Use of Enzymes as Reagents
4	**Blood Glucose Regulation:** Glycosuria of Blood Glucose Regulation Glucose of Tolerance Test of Blood Glucose Regulation Protein Metabolism of Blood Glucose Regulation
5	**Urine Analysis:** Urine- Physicochemical Characteristics and Constituents Collection of Urine Preservation of Urine Specimen Measures of Urine- Proteinuria Glucose Ketone Bodies Bile Pigments Urobilinogen Urobilin Porphyrins Haematuria Calcium in Urine
6	**Clinical Chemistry:** Photoelectric Colorimeters Flame Photometry Beer's Law Systronic Colorimeter Spectrophotometers Clinicial Chemistry- Specimen Collection and Processing Clinical Chemistry and Drug

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Varley – Clinical Chemistry. Author: William heinemann. Publisher: Medical books Ltd. and inter science books in Newyork.

B. KALPLAN – Clinical Chemistry. Author : C.V. Mosoby Company. Publisher : St. Loie's Washington.

C. TEITZ – Clinical Chemistry. Author : William B. Publisher : Sainders Company Harcourt (India)

PATHOLOGY- PAT13201

UNIT	CONTENTS
1	**Understanding Blood Related Diseases:** Leukemia – Introduction and Classification Myelodysplastic Syndromes Preleukemic Conditions Hemophilia Thalassemia Sickle Cell Anemia Blood Poisoning
2	**Laboratory Methods Used In Investigation of Hemolytic Anemia:** Osmotic Fragility Investigation of G-6 PD deficiency Test for sickling Estimation of HB-F, Hb-A2 Plasma Hemoglobin and Haptoglobin Demonstration of Hemosiderin in Urine Hemoglobin Electrophoresis Test for Auto Immune Hemolytic Anemia Measurements of Abnormal Hb Pigments
3	**Origin, Formation and Circulation of Blood Cells:** Science of blood cell formation Bone marrow Sites Hematopoiesis, Anemia introduction and classification Megaloblastic Anemia, Iron deficiency anemia and other Hypochromic Microcytic Anemia's Hemolytic Anemias I – Introduction and Classification Aplastic Anemia Anemia of chronic disorders Malaria Bleeding disorders – Introduction and Classification- Congenital Bleeding Disorders Acquired Bleeding Disorders
4	**Blood Banking** Blood Group System Blood Group Incompatibility—ABO, Rh & Systems

	Cross Matching Test in emergency Blood Bank Preparation of Blood- Preparation and use of whole blood Blood components washed red cells Plasma preparation Blood Collection Procedure Screening, Selection and Care of Donor Medical Registration and Physical Examination Transport and Storage Risk assessment for AIDS and Serum Hepatitis
5	**Blood Grouping:** ABO RH and others system of blood groups, Bombay group. Antibodies to ABO system Anti AB and Anti D Antibody, ABO Testing slides and tube test, Rh grouping test and slide,
6	**Cross Matching:** Reasons of Cross Match Roles, formation and methods of checking followings- Saline Albumin Comb's Enzymes Comb's test
7	**Pathological Analysis:** Analysis of Body fluids Analysis of Semen Sputum Analysis Stool Analysis Urine Analysis

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Robbins Basic Pathology by Vinay Kumar, M.D., Abul K. Abbas, Jon C. Aster-Elsevier Health Sciences, 2012

B. Textbook of Pathology/ Pathology Quick Review and MCQs Harsh Mohan-JP

MICROBIOLOGY-II- MBL13201

UNIT	CONTENTS
1	**Systemic Bacteriology:** Staphylococcus Streptococcus Micrococci Pneumococcus Neisseria Corynebacteria Bacillus Clostridium Enterobacteriaceae- Klebsiella Escherichia coli Proteus Salmonella Shigella Pseudomonas Spirochetes
2	**Parasitology:** General Parasitology- Host parasite relationship Classification of parasites Protozoa Helminthes Cestodes- Taenia saginata Taenia solium Echinococcus Hymenolepis Nana Trematodes- Fasclola hepatica Schistosoma Nematodes- Trichinella spiralis Trichuris trichiura Strongyloides stercoralis
3	**Virology:** Morphology of viruses Replication of viruses Cultivation of viruses Laboratory diagnosis of viral infections
4	**Mycology:** Classification of Fungus Laboratory Diagnosis- Collection and transport of Specimen

	Direct Microscopy Fungal Culture Classification of Fungal Diseases- Superficial Mycoses Subcutaneous Mycoses Systemic Mycoses Opportunistic Mycoses

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Practical microbiology - Prof. C.B. Baveja.

B. Clinical pathology & bacteriology - Sachdev K.N.

C. Text books of microbiology - D.R. Area.

D. Text books of medical laboratory technology - Praful Godgar.

BIOCHEMISTRY-II BCH13201P

UNIT	CONTENTS
1	Practical I- Estimation of blood sugar, Glucose- Orthotoluidine and glucose oxidase methods, Urea- DAM method and urease Berthelot reaction. Serum Creatinine – Jaff's method end point and kinetic analyses modes Serum uric acid- Phosphotungstate method Serum total proteins – Biuret method Serum Albumin- Dye binding (BCG) methods Serum Total Cholesterol- Modified Zag's method and Enzymatic method Serum Bilirubin- Malloy Evelyn Method Vandengerg reaction- concept of Conjugated Bilirubin Total and Conjugated Bilirubin estimations.
2	Practical II- Aminotransferases - AST and ALT-Reitman Frnakel method Phosphatases : Alkaline and Acid Phosphatases King- Armstrong method (Disodium Phenyl Phosphate) Bowers and Mc. Comb(4-Nitrophenyl phosphate) Serum Amylase: Amyloclastic method of van loon Urine Analysis- Measurement of specific gravity Identification of Sugar Ketonebodies Proteins, Blood, Bile salts, Bile pigments and Urobilinogen Standardization of different methods for estimation of Glucose, Urea Creatinine, Proteins and Transaminases Standardization of pipettes and photometric instruments Agarose gel and cellulose acetate electrophoretic separation of serum proteins, lipoproteins and haemoglobins Paper chromatographic separation of aminoacides and carbohydrates present in different body fluids.

3	Practical III- Oral glucoses tolerance test Estimation of 24 hrs urine proteins by Turbidimetric method Plasma fibrinogen estimation by Turbidimetric method Plasma Prothrombin time estimation Estimation of HDL-Cholesterol by Phosphotungstate method Estimation/Demonstration of CPK, LDH, GGT, Lipase and G6PD activities in serum Estimation of urine 17 – Ketosteroids and VMA, CSF analysis, Pandy's and none-Apelt tests Estimation of proteins glucose and chlorides Estimation of serum calcium and inorganic phosphate Practice use of automated pipettes Demonstration working with different auto analyzers Practice of various quality control measures followed to maintain quality of the laboratory.
4	Practical IV- Analysis of Normal Urine, Composition of urine, Urinary screening for inborn errors of metabolism, Common renal disease, Urinary calculus, Urine examination for detection of abnormal constituents. Interpretation and Diagnosis through charts Liver Function tests Lipid Profile Renal Function test Cardiac markers, Blood gas and Electrolytes, Estimation of Blood sugar, Blood Urea and electrolytes Demonstration of Strips, Demonstration of Glucometer Procedure for routine screening.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Textbook of Practical Biochemistry by Joshi A. Rashmi Publisher B. Jain Publishers, 2002

B. Practical Biochemistry, 2008 G - Reference, Information and Interdisciplinary Subjects Series by Y. M. Shivaraja Shankara Jaypee Brothers Publishers, 2008

PATHOLOGY – PAT13201P

UNIT	CONTENTS
1	Practical I- Introduction to Histo Pathology Receiving of Specimen in the laboratory Grossing Techniques, Mounting Techniques – various Mountants Maintenance of records and filing of the slides Use & care of Microscope Various Fixatives, Mode of action Preparation and Indication Bio-Medical Waste Management Section Cutting Tissue processing for routine paraffin sections- Decalcification of Tissues, Staining of tissues - H& E Staining
2	Practical II- Cytology Pathology Practical

	. Morphology and Physiology of cell Cytology of Female genital Tract- Urinary Tract, Gastrointestinal Tract, Respiratory Tract, Effusions, Miscellaneous Fluids, Collection, Preservation. Fixation and Processing of various Cytological Specimen . Preparation and Quality control of various stains and reagents used in cytology . All routine and special Staining techniques in cytology FNAC, Immunocytochemistry, Flowcytometry, Automation in Cytology.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. PATHOLOGY PRACTICAL BOOK For Undergraduates, Jaypee, by Harsh Mohan Paperback

B. http://medicalebooks-aslam.blogspot.in/search/label/pathology

MICROBIOLOGY-II – MBL13201P

UNIT	CONTENTS
1.	**Microbiology Practical:** Compound Microscope Demonstration and sterilization of equipments – Hot Air oven, Autoclave, Bacterial filters. Demonstration of commonly used culture media, Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, Mac Conkey medium, LJ media, Robertson Cooked meat media, Potassium, Tellurite media with growth, Mac with LF & NLF, NA with staph, Antibiotic susceptibility test. Demonstration of common serological tests – Widal, VRDL, ELISA, Grams staining, Acid Fast staining Stool exam for Helminthic ova Visit to hospital for demonstration of biomedical waste management Anaerobic culture methods.
2.	**Parasitology Practical:** Collection and transport of specimens for diagnosis of parasitic diseases Examination of faeces for parasite ova and cysts etc. by direct and concentration methods (salt floatation and formol-ether methods). Egg counting techniques for helminthes micrometry and mounting of slides Examination of blood for protozoa and helminthes by wet mount Thick and thin stained smears Examination of blood for Microfilariae including concentration techniques Examination of other specimens eg. Urine , CSF, Bone marrow etc. for parasites. Preparation & performance of stains –Leishman, Giemsa, Lugol's iodine, Micrometry. Identification of medically important adult worms Identification of common arthropods and other vectors viz. mosquito, Sandifly, tick, mites, Cyclops Preservation of parasites-mounting, Flexing, Staining etc.
3.	**Immunology Practical:** Collection of blood by venu puncture separation of serum and preservation of serum for short and long periods. Performances of serological tests, Bacterial slide agglutination, Widal, Pregnancy test, ALSO, CRP, RF, Elisa, Skin tests. Demonstration of Casoni's test, MT test.
4.	**Virology Practical:** Preparation of glassware for tissue cultures (washing, sterilisation)

	Preparation of buffers like PBS, Hank's. Preparation of clinical specimens for isolation of viruses Collection & transport of specimens Serological tests-ELISA for HIV & HBsAg etc Chick Embryo techniques-inoculation and harvesting Handling of mice, rats and guinea pigs for collection of blood Molecular techniques in virology.
5.	**Mycology Practical:** KOH & LPCB Preparation, Staining Techniques, Culture of Fungi, Slide Culture Basic Identification techniques.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Practical Microbiology by Vasanthakumari BI Publications Pvt Ltd, 2009

B. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf

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