NIMS UNIVERSITY

SYLLABUS

OF

BACHELOR OF MEDICAL LAB TECHNOLOGY – BMLT

VERSION 1.2

DIRECTORATE OF DISTANCE EDUCATION

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

BACHELOR OF MEDICAL LAB TECHNOLOGY – BMLT

Eligibility	:	Senior Secondary Level Examination (PCB)
Programme Duration	:	3 Years
Programme Objectives	:	Medical Laboratory Technology, also called 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 BMLT, 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 BMLT include: Senior Technician in Blood Banks, Hospitals, Nursing Homes and Diagnostic Labs.

YEAR I

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
ENG14101	Communication For Professionals	70	30	4
ANT14103	Human Anatomy & Physiology-I	70	30	6
BCH14102	Biochemistry-I	70	30	5
BBN14101	Pathology & Blood Banking	70	30	5
MBL14104	Microbiology-I	70	30	4
ANT14103P	Human Anatomy & Physiology-I	35	15	2
BCH14102P	Biochemistry-I	35	15	2
BBN14101P	Pathology & Blood Banking	35	15	2
TRN14101	Hospital Training-I	35	15	2
			TOTAL	32

YEAR II

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
CSC14207	Fundamentals of Computer Science	70	30	4
BCH14209	Biochemistry-II	70	30	5
PAT14201	Pathology	70	30	5
MBL14210	Microbiology-II	70	30	5
ANT14201	Human Anatomy & Physiology-II	70	30	5
BCH14209P	Biochemistry-II	35	15	2
PAT14201P	Pathology	35	15	2
MBL14210P	Microbiology-II	35	15	2
TRN14201	Hospital Training-II	35	15	2
			TOTAL	32

YEAR III

Course Code	Course Title	Theory/ Practical	Continuous Assessment (Internals)	Credits
EZY14302	Enzymology	70	30	5
BOX14301	Biostatistics	70	30	4
BCH14305	Clinical Biochemistry	70	30	5
BBN14301	Blood Banking	70	30	5
MBL14307	Applied Microbiology	35	15	5
BCH14305P	Clinical Biochemistry	35	15	2
BBN14301P	Blood Banking	35	15	2
MBL14307P	Applied Microbiology	35	15	2
TRN14301	Hospital Training-III	35	15	2
			TOTAL	32

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

COMMUNICATION FOR PROFESSIONALS- ENG14101

UNIT	CONTENTS
1	**Parts of Speech:** Definition of all the sight parts along with examples and their use in language. **Definite and Indefinite articles:** a, an, and, the, Definition and its uses along with examples. **Types of Pronouns:** Personal, Reflexive, Emphatic, Demonstrative, Relative, Indefinite, Interrogative and Distributive pronouns. **Noun:** Defining noun along with types and categories, Gender, Number case **Adjective:** Adjective, Comparison, Adjective used as nouns, Positions of the Adjective and Correct use of Adjectives. **Verb:** Definition, Its forms, Verbs of incomplete predication, Phrases (defining it along with examples). Adjective, Adverb and Noun Phrase. **Clauses:** Defining it along with examples: Adverb, Adjective and Noun Clauses. **Sentence and its Types:** Simple, Compound and Complex, Subject and Predicate (parts of a sentence), Transformation of Sentences. Active and Passive voice, Mood and Narration (Direct and Indirect speeches).
2	**Words and Phrases:** Word formation (prefix, suffix), Idioms, Synonyms and Antonyms, Phonetics, Speech sound, The phoneme, The syllable and IPA transcription.
3	**Business Correspondence I:** Paragraph writing, Introductory remarks, Principles, Writing of single paragraphs and precise writing Letter writing Quotations and Orders- Orders and tenders, Inviting and sending quotations, Placing orders and Inviting tenders.
4	**Business Correspondence II:** Notices, Agenda and Minutes, Application letter, Importance and function, Drafting the application, Elements structure, Preparing CV's.
5	**Applied Grammar:**

	Correct usage of Grammar, Structure of sentences, Structure of paragraphs, Enlargements of vocabulary.
6	**Business Writing:** Written composition, Precise writing and summarizing, Writing of Bibliography, and Enlargement of vocabulary.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. English Grammar and Composition Wren and Martin. S. Chand & Company Ltd
B. Intermediate English Grammar: Raymond Murphy Pub: Foundation Books, New Delhi.
C. Eng. Grammar usage and Composition Tickoo & Subramanian Pub: S. Chand and Co.
D. Living Eng. Structure Standard Alien.

HUMAN ANATOMY & PHYSIOLOGY-I- ANT14103

UNIT	CONTENTS
1	**The Human Body:** Definitions Sub-divisions of Anatomy Terms of Location and Position Fundamental Planes Vertebrate Structure of Man Organization of the Body Cells and Tissues
2	**The Skeletal System:** Types, Structure and Growth Division of the Skeleton- Appendicular skeleton Axial skeleton Names of Bones and their parts Joints Classification Types of movements with examples
3	**Anatomy of Circulatory System:** Heart - Size, position coverings and chambers, Blood Supply Nerve supply Blood Vessels General Plan of Circulation Pulmonary Circulation- Names of Arteries and Veins Position of Arteries and Veins Lymphatic System General Plan
4	**Anatomy of the Respiratory System:** Organs of Respiratory- Larynx

	Trachea Bronchial Tree Respiratory Portion- Pleural Cavity and Lungs Brief knowledge of parts and position
5	**Anatomy of the Digestive System:** Components of Digestive System Alimentary Tube Anatomy of Organs of Digestive Tube- Mouth Tongue Tooth Salivary Glands Liver Bleary apparatus Pancreas
6	**Blood:** Definition and Composition Properties and Function of Blood Haemogram- RBC WBC Platelet count HB Concentrations Function of Plasma Proteins Haemopoiesis Blood Group - ABO and RH grouping Coagulation & Anticoagulants Anemia – Causes, Effects & Treatment Body fluid –Compartments and composition Immunity- Lymphoid tissue Clotting factors Mechanism of Blood Clotting Disorders of White Blood Cells Disorders of Platelets Disorders of Clotting
7	**Cardio Vascular System:** Function of Cardiovascular System. Structure of Cardiovascular System. Cardiac cycle Functional tissue of Heart & their function Cardiac Output E.C.G Blood Pressure Heart Rate
8	**Respiratory System:** Function of Respiratory System Functional (physiological) Anatomy of Respiratory System Mechanism of Respiration—Lung volumes & capacities Transport of Respiratory Gases
9	**Digestive System:** Function of Digestive System, Functional Anatomy of Digestive System, Composition and Functions of all Digestive Juices Movements of Digestive System (intestine) Digestion & Absorption of Carbohydrate, Proteins & Fats

10	**Nervous System:** Functions of Nervous System, Neuron - Conduction of impulses and factors effecting it Synapse - Transmission, Reception, Reflexes, Ascending and Descending Tracts Functions of various parts of the Brain, Cerebro Spinal Fluid (CSF)—Composition, Functions & Circulation, Lumbar Puncture Autonomic Nervous System - and its types, Functions of (ANS).

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.
D. Review Medical physiology. Author : Ganang. Application and Lange.

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BIO CHEMISTRY –I- BCH14102

UNIT	CONTENTS
1	**Introduction to Medical Laboratory Technology:** Medical Laboratory Technology- An Introduction Role and Responsibilities of Medical Laboratory Technologist Safety Measures and First Aid Laboratory Glassware and Instruments- Laboratory Glassware— Care and Maintenance Laboratory Equipments— Care and Maintenance Sterilization and Disinfection Distilled Water- Meaning and Types distilled water plants Preparation and Storage
2	**Analytical Balance:** Analytical Balance— An Introduction Use and maintenance of Analytical Balance
3	**Preparation of Solution Reagents:** Standard Solutions- Types and Use of Standard 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

4	**Introduction to Biochemistry-I:** History of Biochemistry Chemical Composition of Important Biomolecules Chemical Balance—Types, Principles and Practice Applications of Biochemistry
5	**Fundamental of Physical Biochemistry:** Indicators Strength of a Solution- Percent Solutions Part Dilutions Molar Solutions Normal Solutions Buffer Solutions p^H- Definitions p^{Ka} Value p^H Measurement—Methods, Use and Maintenance of pH meter
6	**Biological Specimens:** Collection and recording of Biological specimens Separation of Serum and Plasma Preservation and Disposal of Biological Samples/materials
7	**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

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-BBN14101

UNIT	CONTENTS
1.	**Introduction to Clinical Hematology:** Maintenance and use of Instruments and Glasswares Preparation of Stains, Buffers and Solutions
2.	**Method of Collection of Blood Sample:** Arteries Methods of Collection of Blood Sample Anticoagulants used in tests and preservation Shelf life of Blood Changes taking place in Blood Storage—Na^+, K^+
3.	**Red Blood Cells:** Normal Morphology Blood Count Morphology of physicochemical parameters and the diseased state Red cell animals and their relevance to normal and diseased state White blood cells and platelets—Morphology count and Isolation Anemia's –Meaning, Types and Classification Physicochemical characteristic features Clinical features and diagnosis, Plastic anemia, Hemolytic, Megaloblastic
4.	**Blood Composition:** 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- MCV, MCH, MCHC.
5.	**Basic Hematological Techniques:** Cell counters: Principle, Interpretation & Pitfalls Stains in common use in Hematology- Routine Stains of Blood & Bone Marrow Staining for Red Cell Inclusions Leucocyte Cytochemistry Tests for Hemolytic Anemia- Fragility Tests RBC Enzyme Assay Hemoglobin Stability Test Hemoglobin Electrophoresis Tests for PNH Tests for Immune Hemolytic Anemia Other Test- Test for Cryoglobulins Plasma Viscosity
6.	**Preparation of Blood Films:** Stains used in Hematology Preparation of Buffy coat smears
7.	**Laboratory Methods Used In the Investigation of Anemia:** RBC Morphology & Normal and Abnormal Hypochromia Vitamin B12 and Folic Acid

	Schilling Test Serum Iron and Iron Binding Capacity Screening for Sickle Cell Anemia
8.	**Preparation of Smear For Diagnosis of Blood Parasites:** Laboratory investigations of Blood Parasites, Test of L.E. cell.
9.	**Understanding Blood Related Diseases:** Leukemia – Introduction and Classification Myelodysplastic Syndromes Preleukemic conditions Physiology of Coagulation and Hemostasis, Hemophilia, Thalassemia, Sickle Cell Anemia, Blood Poisoning
10.	**Laboratory Methods Used In Investigation of Hemolytic Anemia:** Osmotic Fragility Investigation of G-6 PD deficiency, Test for sickling, Estimation on 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.
11.	**Origin, Formation and Circulation of Blood Cells:** Theories 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 – Introductions and Classification Hemolytic Anemias II – Structural Hemoglobinopathies, Aplastic Anemia Anemia of Chronic Disorders Malaria, Bleeding disorders – Introduction and Classification, Congenital Bleeding Disorders, Acquired Bleeding Disorders.
12.	**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 Registration Medical History and Physical Examination Transport and Storage Risk assessment for AIDS Risk assessment for Serum Hepatitis
13.	**Blood Grouping:** ABO RH and others system of Blood Groups-

	Sub group of A Bombay group. Antibodies to ABO system Anti AB and Anti D Antibody, ABO Testing slides and tube test, Reverse grouping discrepancies, between cell and serum results sources of error, Rh grouping test and slide, Rapid tube test (false positive and false negative results) D^U test system and its significance.
14.	**Cross Matching:** Reasons of cross match, Roles, Formation and Methods of checking followings- Saline Albumin Coomb's Enzymes Coomb's Test- Direct and Indirect Principle and explanation of procedure Sources of Error, Control interpretation and clinical application, Demonstration of Coomb's test direct and indirect. Labelling of Tubes, Methodology Legal implication in computable cross Auto antibodies affecting cross matching Plasma expanders affecting cross matching Multiple myeloma affecting cross matching Difficulties in cross match & methods of investigation
15.	**Quality Assurance in Haematology:** Specimen Collection. Risk assessment for AIDS and Serum Hepatitis.

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- MBL14104

UNIT	CONTENTS
1.	**Introduction to Microbiology:** Microbiology- Definitions Safety Measures in Microbiology Laboratory Care and Maintenance of Glassware
2.	**Culture Media:** Types of Media Preparation of Media
3.	**Antiseptics and Disinfectants:** Definition and Types Testing of Disinfectants
4.	**Methods and Techniques in Microbiology Staining methods and Preparation of Reagents:** Staining methods— Principles Preparation of reagents Aerobic and Anaerobic Culture Methods
5.	**Antigen and Antibody:** Antigen and Antibody—General Characteristics and Nature Principle of Antigen and Antibody reaction
6.	**Clinical samples for Microbiological Investigations:** Collection and Transportation of Clinical Samples Processing of Clinical Samples
7.	**Antibiotics and Agents for Bacteria and Fungi:** Principle and mode of action of Antibiotics Principle and mode of action of Chematherapeutic Agents
8.	**Care and handling of laboratory animals**
9.	**Managing Microbiology Laboratory:** Laboratory Organization Recording of results Quality control in Microbiology
10.	**Introduction to Virology:** Morphology of viruses Replication of viruses Cultivation of viruses Laboratory diagnosis of viral infections Physiochemical characteristics of viruses
11.	**Introduction to Medical Parasitology:** General Parasitology Host Parasite relationship Classification of Parasites Protozoa Helminthes Cestodes- Taenia saginata Taenia solium Echinococcus Hymenolepis Nana Trematodes- Fasciola hepatica Schistosoma Nematodes

	Trichinella Spiralis Trichuris Trichiura Strongyloides Stercoralis
12.	**Systemic Bacteriology:** Staphylococcus Streptococcus Micrococci Pneumococcus Neisseria Corynebacteria Bacillus Clostridium Enterobacteriaceae- Klebsiella Escherichia coli Proteus Salmonella Shigella Pseudomonas Spirochetes

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Medical Laboratory manual for tropical countries
B. Medical Laboratory technology a procedure manual for routine diagnostic test - vol - I, II, III.
C. Author: Kanai L. Mukharjee Tata Mcgraw Hill pub. New Delhi.

HUMAN ANATOMY & PHYSIOLOGY –I- ANT14103P

UNIT	CONTENTS
1	Practical I- Labelled Diagrams of different Organs and Bones Identification and discussion of Organs, Bones, Certain fundamental techniques in Histology and Museum techniques and body Embalming Demonstration of slides of Primary Collection of Blood samples Preparation of Blood Smears
2	Practical II- Preparation of Stains. Diluting fluids. Thick thin smears Staining procedures Cell counts- RBC, WBC, Platelet and Absolute Cosinophil Counts PCV-Erythorocyte Indices Reticulocyte count Differential count Blood Grouping – , Cross-Matching, Rh typing

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Practical Human Anatomy and Physiology by S.R.Kale, R.R.Kale, Nirali Publications

B. Human Physiology by Chaterjee (cc). Medical allied agency

BIO CHEMISTRY –I- BCH14102P

UNIT	CONTENTS
1	Practical I- Laboratory Management and Planning- Reception and recording of specimens, Maintenance of laboratory records and reporting Specimen Collection- Whole blood, Plasma, Serum, Urine, C.S.F. and other body fluids, Preservation of Specimens and Anticoagulants. Glassware- Types, Use, Care and maintenance of flasks, Pipettes, Cylinders, Funnels tubes, Thermometers. Disposal Regulations, Workplace hazards. Specimen collection, Identification, Transport, Delivery and Preservation. Patient preparation for tests. Anticoagulants and Preservatives
2	Practical II- 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 Practicals related to solvent extraction, Partition coefficient, Dialysis, Concentration, Desalting and Ultracentrifugation. Calibration of equipments and laboratory wares. Familiarization and usage of Colorimetry, Specterophotometry, Fluorimetry, Flame photometry, Atomic absorption spectroscopy, Nephelometry, Osmometry, Chemiluminesence, Ion selective electrodes, Flowcytometry. Chromatography- Paper, Thin layer, Gel filteration, 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 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 & BLOOD BANKING – BBN14101P

UNIT	CONTENTS
1	**Blood Bank Administration:** Record Keeping, Computerization in blood transfusion services, Blood grouping ABO, PH typing Various Techniques- Cross Matching-Tube test, Slide Test, DU Test, Sub Grouping Test. Coomb's Test- Direct coomb's test, Indirect coomb's test. Compatibility Testing for blood transfusion cross matching test.5% cell suspension and 10% cell suspensions, HIV and AIDS demonstration.
2	**Introduction:** Aim, basis, Interpretation, Safety in clinical pathology laboratory. Laboratory Organization- Instruments, Glassware, Sample collection and specimen labeling, routine test, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution and interpretation of result, normal values. Urine Routine Examination- Normal / Abnormal constituents of urine. C.S.F. and other body fluid examination. Semen Analysis. Sputum test. Different types 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

HOSPITAL TRAINING-I--TRN14101

YEAR II

FUNDAMENTALS OF COMPUTER SCIENCE-CSC14207

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)

BIO-CHEMISTRY-II- BCH14209

UNIT	CONTENTS
1.	**Introduction to Biochemistry-II:** Metabolism Metabolic Diversity and Living Organisms Energy Molecules Metabolic Reactions Laws of Thermodynamics or Bioenergetics Concepts of Molecular Weight Atomic Structure Valence
2.	**Units of Measurements:** International System of Units Measurement of volume Molarity Molality Normality Mole Fraction Mass Percentage Volumetric Apparatus and Calibration of Volumetric Apparatus Procedure for Calibration of Volumetric Apparatus
3.	**Acids and Bases:** Basic Chemistry of Acids and Bases The pH Scale Titration Donor-Acceptor Concept of Acids and Bases Autoprotolysis Types of Acids and Bases Acid- base Physiology Volumetric Analysis Carrying out titration Acid- Base Solution Formulas Experimental Procedure Chloride Estimation
4.	**Chemistry of Carbohydrates:** Carbohydrates—Structure, Function and Types- Importance of Glucose and Glucose Homeostasis Types of Carbohydrates Carbohydrate Metabolism Determination of Glucose- Benedict's Test for Urine In Blood Glucose Tolerance Test(GTT) Insulin Tolerance Test

	Special Test for Diabetes Determination of Proteins in Body Fluids- Determination of Plasma Proteins Determination of Serum Albumin Determination of Albumin to Globulin Ratio Determination of Fibrinogen Monosaccharides Oligosaccharides Disaccharides Polysaccharides
5.	**Chemistry of Lipids:** Lipids- Meaning Classification Biological Importance Simple Lipids- Tricycle corals and waxes – composition and functions. Compound Lipids-Composition and Functions- Phospholipids Sphingolipid Glycolipid Derived Lipids Fatty Acids- Saturated and unsaturated steroids and their properties Electrolytes in Body Fluids– Determination and clinical significance(Potassium, Calcium, Phosphorus chloride) Determination of Serum Cholesterol Triglycerides.
6.	**Chemistry of Proteins and Amino Acids:** Protein– Definition, Classification and Function Amino Acid- Classification, Properties. Side chains of Amino acid, Their Properties. Peptides– Biologically active peptides examples such as GSH Insulin its structure.
7.	**Chemistry of Nucleic Acid:** DNA- Structure and Function RNA- Types, Structure and Function.
8.	**Non-Protein-Qualitative and Quantitative Tests:** Nitrogenous Compounds Principles of Urea Creatinine and Uric Acid formation.
9.	**Chemistry of Carbohydrates:** Metabolism of Glucose Glyolysis Glyconeogenesis. TCA Cycle Regulation of Blood Glucose. GIT Interpretation. Diabetes Mellitus.
10.	**Vitamins:** Definition, Classification, Source Function, Deficiency and Disorders.

11.	**Flame Photometry and Atomic Absorption Photometer:** Principle and Use.
12.	**Photometry and Spectrophotometry:** Principle and Use Beer – Lambert Laws Wave Lengths, Transmittance, Absorbance, Verifications of Beer's law and its limitation, Turbidometry principle and applications.
13.	**Chromatography:** Chromatography General Account, Principle and Uses of Paper Chromatography.
14.	**Tests:** Colorimetery, Spectrophotometry, Flamephotometry, Atomic Absorption Spectroscopy Electrometric determination of Na+ and K+ Chromatography, Electrophoresis, Radio immunoassay (RIA) and ELISA

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)

D. Biochemistry. Author : U. Satynarayan. Publisher : Books and allied Ltd., Kolkata 700009 (India).

E. Text books of medical biochemistry. Author : Ramkrishan(S), Rajan(R).

PATHOLOGY - II- PAT14201

UNIT	CONTENTS
1.	**Introduction to Histopathology:** General principle Collection of specimen, numbering and giving issue list. Grossing technique. Various fixatives – Mode of action, Indication preparation.
2.	**Equipments used in Histopathology:** Tissue processor Microtome Knife sharpener Automatic slide strainer Knives Freezing microtone, Cryostat Hot plate Water bath
3.	**Decalcification:** Methods Advantages and disadvantages

4.	**Major Techniques used in Histopathology:** Frozen section Cryotals techniques Staining and mounting technique Morbid Anatomy
5.	**Tissue Processing:** Fixation Dehydration, Clearing and Impregnation in Paraffin Making of Paraffin Block Section cutting errors and their correction
6.	**Preparation of Haematoxylin and Eosin:** Methods of Preparation Staining technique for rapid diagnosis Mounting
7.	**Preparation of different types of special stains:** Histo-chemical staining Cyto-chemical staining
8.	**Introduction to Electron Microscopy:** Working and principles of Electron Microscope Allied Techniques for Electron Microscopy
9.	**Museum Techniques:** Collection of Museum specimens Preparation and Storage Methods of Mounting
10.	**Cytology:** Fine Needle Aspiration Cytology Branches of Diagnostic Cytology Clinical Applications Advantages and Limitations Precautions and Contradictions Preparation for Biopsy Equipment Biopsy Procedure— Fixation and Staining Imaging Methods for Aspiration Cytology
11.	**Malignant Cytology:** Technique of collection of various specimens and processing, Fixation and staining technique, Morphology and various characteristics of common malignancies in comparison with normal
12.	**Cyto-Chemistry:** Staining technique for Glycogen Staining technique for Fat Staining technique for Mucin
13.	**Cell Morphology and Physiology:** Cytoplasm of the resign cell Mitosis of resting cell mitosis and its mechanism Correlation to cell structure and function Automation in Cytology Cytosine-2. Papanicolaou Method (PAP).
14.	**Hormone Cytology:** Anatomy Structure and Physiology of Female Genital Tract. Correlation of structure of Female Genital Tract and Ovarian Hormones. Various Cytological Indies.
15.	**Malignant Cytology:** Cervical Malignant Classification of Cervical Smear Characteristics of normal inflammatory and dysplasia (mild, moderate, severe) Ca-in-situ

	Sg Cell Carcinoma Adenocarcinoma of Endocervix Characterization of radiation changes in cells Endometrial Malignancy Cytology of Normal Hyperplasia and Adenocarcinoma. Cytological screening of Cervical Cancer Ovarian Carcinoma
16.	**Urinary Tract** Anatomy, Histology and Physiology of the Urine System Collection, Preparation of samples. Cytology of normal, Non-Malignant and Malignant Tissues of Urinary Tract
17.	**Respiratory** Tract Anatomy, Histology, Physiology and Normal Cytology of the Respiratory Tract. Collection, Selection of material and making smear. Cytology of various types of Bronchogenic Carcinoma.
18.	**Cytopathology-** General properties of living organisms- General properties of chemistry of the cells General properties of Cellular membranes General properties of Cytoskeleton General properties of Endoplasmic Reticulum General properties of Golgi Body General properties of Lysosomes General properties of Nuclear envelope General properties of Chromatin and Chromosomes General properties of Mitosis Outline of Embryology- Gamogenesis Reproductive cycle Fertilization Cleavage A model of Gastrulation Histology Epithelial tissue Connective tissues (blood connective, cartilage, bone) Muscular tissue Nervous tissue

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Diagnostic Cytopathology: Expert Consult: Online and Print by Winfifred Gray MD BS FRCPath and Gabrijela Kocjan MB BS FRCPath (Hardcover - Jun. 21, 2010).

B. Practical principles of Cytopathology Revised by Richard M. DeMay (Hardcover - Oct. 9, 2007).

C. Differential Diagnosis in Cytopathology with CD-ROM by Paolo Gattuso, Vijaya B. Reddy, and Shahla Masood (Hardcover - ct. 30, 2009).

D. The Bethesda System for Reporting Thyroid Cytopathology: Definitions, Criteria and Explanatory Notes by Syed Z. Ali and Edmund's Cibas (Paperback - dec. 11, 2009).

MICROBIOLOGY –II- MBL14210

UNIT	CONTENTS
1.	**Classification of Bacteria:** Staining on Bacilli- Gram Stain ZN Stain Identification of bacteria on basis of Cultural Characteristics, Morphological and Serological features- Staphylococcus Staphylococcus aureus Coagulase negative staphylococcus Streptococcus- Group A Streptococci Group B Streptococci Streptococci Viridans Enterococci Micrococci Pneumococcus Neisseria- N. Meningitidis N. gonorrhoea Clostridium Enterobacteriaceae- Escherichia coli Klebsiella Proteus Salmonella Shigella
2.	**Pathogenic and Nonpathogenic Fungi:** Morphology Yeast- Dermatophytes Cryptococcosis Histoplasma Nocardia Common lab fungal contaminants.
3.	**Parasitology:** General parasitology Host parasite relationship- Classification of parasite Protozoa- Entamoeba histolytica Giardia lamblia Trichomonas Vaginalis Leishmania Trypanosoma Plasmodium Toxoplasma gondii Halminthes Cestodes- Taenia Saginata Taenia Solium

	Echinococcus granulosus Hymenolepis nana Trematodes- Fasclola hepatica Schistosoma Nematodes- Trichinella Spiralis Trichuris Trichiura 3Strongyloides Stercoralis Ancylostoma Duodenale Entrobrius Vermicularis Ascaris Lumbricoides Wuchereria Bancroftii Loa-loa Dracunculus Medinensis
4.	**General Properties of Virus:** Morphology of Viruses- Sizet Struture and Symmetry Nucleic Acid Chemical Properties Susceptibility to Physical and Chemical agents Replication of Viruses Cultivation of Viruses- Animal Inoculation Embryonated Egg Inoculation Tissue Culture Viral assays- Total Particle Count Infectious Virions assay Laboratory diagnosis of viral infections- Direct demonstration of virus and its components Isolation of Virus Detection of Specific antibodies
5.	**Assay methods:** Physical Chemical
6.	**Parasitology** Introduction to Medical Parasitology and safety measures General characteristics and classification of protozoa of Medical Importance Morphology, Life cycle and laboratory diagnosis of intestinal Protozoa-Amoebae and Giardia Morphology and diagnosis of Oral vaginal flagellates Trichomonas E Gingivalia Morphology and life cycle of Haemoprotozoan Malarial parasite including falciparum Laboratory diagnosis of Malaial infection General characteristics and classification of Medical Helminthology Morphology and life cycle of Nematodes (Intestinal) Ascaris Enterobious Ancylostoma Trichuris Strongloides Laboratory diagnosis of intestinal nematode infection
7.	Compound microscope optical systems magnification and maintenance
8.	Spirochetes – Morphology and Serological (T. Palladium) diagnosis.
9.	Mycobacterium – Morphology, Classification – Identification by Biochemical Test.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Practical Microbiology by R.C. Dubey, D.K. Maheshwari, S. Chand & Company Limited, 2002

B. Practical Microbiology by Arora D.R., Bharti Arora, CBS Publishers & Distributors 2Rev Ed edition, 2007

HUMAN ANATOMY & PHYSIOLOGY-II- ANT12301

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)

BIO-CHEMISTRY-II – BCH14209P

UNIT	CONTENTS
1	Practical I- Introduction to Apparatus, Instruments and uses of Chemical Balance. Preparation of Solutions, Calculation of Molecular Weights and Equivalent Weights Preparation of Normal Solution, Molar Solutions, Percent Solution and Reagents Dilution techniques. Measurements of Hydrogen Ion concentration qualitative Analysis. Identification of Carbohydrates, Proteins and Substances of Biochemical Importance.
2	Practical II- Demonstration of Colorimeter, Spectrophotometer, Perimeter, Single pan balance. Estimation of Blood sugar. Test proteins, Lipids, Carbohydrates. Sample collection, Preservation and Preparation of protein – free filtrate. Demonstration of Plasma Electrophoresis. Estimation of NPN substances.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

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

B. Practical Biochemistry, 2008 by Y. M. Shivaraja Shankara, Jaypee Brothers Publishers, 2008

PATHOLOGY – PAT14201P

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- Blood urea, Serum creatinine, Serum uric acid, Serum total protein estimation, Serum albumin estimation, serum globulin estimation, Serum glucose estimation. Total Cholesterol Estimation, HDL cholesterol (direct) estimation, LDL cholesterol (direct) estimation Triglyceride Estimation Serum Bilirubin total estimation, Serum Bilirubin direct estimation, Serum amylase estimation, Serum GOT (AST) estimation, Serum GPT (ALT) estimation Alkaline Phosphatase Estimation Acid Phosphatase Estimation Serum Sodium Estimation Serum Potassium Estimation Serum Chloride Estimation CK-NAC estimation.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. PATHOLOGY PRACTICAL BOOK For Undergraduates, by Harsh Mohan Paperback, Jaypee, 1e

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

MICROBIOLOGY–II- MBL14210P

UNIT	CONTENTS
1	Practical I- Gram stain. Special Stain (Zeihl Neelson, Alberts, spore staining.) Staining Culture, Biochemical and Serological test of all organisms listed in systemic. Study of Bacteria and Antibiotic sensitivity. Hanging drop preparation. Normal Stool Examination.
2	Practical II- Stool concentration method.

	Stool examination for E. histolytica. Blood smears and staining procedures for haemoflagellates, malarial and filarial parasites. Faeces examination for Giardia, Trichomonas vaginalis, Ascaris, hookworm, whip worm and H. nana ova, Taenia solium, Taenia sagenata ova. Trematodes.

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

HOSPITAL TRAINING-II-TRN14201

YEAR III

ENZYMOLOGY- EZY14302

UNIT	CONTENTS
1	**Introduction to Enzymology:** Enzymes and their characteristics Enzyme specificity Classification of enzymes Coenzymes Cofactor and activator factor affecting enzyme activity km value and its significance in enzyme reactions
2	**Enzyme Inhibition:** Enzyme inhibition-- Meaning Various types of enzyme inhibition and their uses in drug therapy Competitive Inhibitors Non competitive Inhibitors Uncompetitive Inhibitors Mixed inhibitors. Study of enzymatic reactions commonly employed in clinical laboratories.
3	**Enzymes in Clinical Diagnosis:** Iso-enzymes Allosteric enzymes Intra cattalo's distribution of enzymes in relation to metabolic pathways Enzymes in clinical diagnosis.
4	**Hormones:** Hormones and their mode of action- Peptides Steroids Amino and Derivatives Fatly and Derivatives Hormones recreated by Pituitary, Thyroid, Pancreas and Adrenal Glands

	Techniques employed in hormones assay
5	**Radio Isotopes:** Radio Isotopes commonly used in Medical Sciences Application of Radio Isotopes Monitoring of radioactivity by use of Scintillation counters radio immune assay Handling and hazards of radiation envied by radio isotopes
6	**Enzyme Acid and Alkaline:** Enzyme acids and alkaline—Importance and types Phosphates AST ALT Amylase Lactate dehydrogenase CPK

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Catalysis in Chemistry and Enzymology By William Platt Jencks

B. Enzymology, by T. Devasena, Oxford University Press, 2010

BIOSTATISTICS- BOX14301

UNIT	CONTENTS
1	**Introduction to Biostatistics:** Biostatistics—Meaning and Definitions Significance of Statistics in Biomedical Sciences Statistics—Meaning and types Variables— Meaning, types and measurement
2	**Tabulation and Presentation of Data:** Raw and Standard Scores Frequency distribution Tabulation and Presentation of data
3	**Population and Sample:** Population and Sample Sampling types and design Sampling techniques
4	**Normal and Binomial Distribution:** Normal distribution Binomial distribution curve Skewness and Kurtosis
5	**Measures of Central Tendency and Variability:** Measures of Central tendency Measures of Dispersion
6	**Measures of relationship between Variables:** Correlation—Pearson's, Spearman's and Rank differential Multiple Correlation Partial Correlation Regression

7	**Tests of Significance:** Z-test T-test F-test ANOVA—One way and Two way

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. B.K. Mahajan. Publisher : Jaypee Brothers Medical Publishers P. Ltd. B-3 Emca house 22/23B, Ansari Road duryangbaj post box 7193 New Delhi-110002

B. Biostatistics: The Bare Essentials by Geoffrey R Norman, PH.D., David L. Streiner

CLINICAL BIOCHEMISTRY- BCH14305

UNIT	CONTENTS
1	**Cell:** Components of cell and their functions Cell fractionation and separation of cellular components structure Bio chemical functions and marker enzymes of cell membranes Nucleons, Mitochondria Endoplasmic reticulum Golgi apparatus Ribosome, Liposome's and Cytoplasm. Concept of pH and its measurement. Indicators, Solutions and Physiological buffers.
2	**Chemistry of Carbohydrates:** Classification and functions Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides. Mucopolysaccharides and their functions. Dextrin and Dextrin Monosaccharide derivatives. Dietary Carbohydrates and their Utilization. Metabolic pathways of Carbohydrate Metabolism
3	**Lipid Chemistry:** Classification and Biological Functions
4	**Vitamins Chemistry:** Classification and Biological Functions
5	**Chemistry of Nucleic Acids:** Different types of RNAs Central dogma of life Generalized features of Genetic Code Brief description of Replication, Transcription and Translation. Metabolic roles of Vitamins and Minerals. Dietary sources, Functions and Disorders.
6	**Glucose:** Anaerobic Glycol sis, Glycol sis, Release of energy from Glucose, Phases of Glycol sis,

	Energy yield from the pathway, Sources of Glucose for Glycol sis, The Citric Acid Cycle, Cellular respiration, Stages of Cellular respiration, The Critic acid cycle, Phases of reactions of Citric acid Cycle, Additional pathways in Carbohydrate Metabolism, Pentose Phosphate Pathway, Glyoxylate cycle, Gluconeogenesis, Glycogen synthesis, Starch synthesis, Election Transport and Oxidative Phosphorylation, Introduction, Photosynthesis, Basic process of photosynthesis, Physics of light, Fatty acid oxidation, Ketone body metabolism, Fatty acid biosynthesis, Cholesterol Biosynthesis. Principles of assay procedures for biological materials Total Proteins- Albumin Glucose Urea Uric acid Creatinine Cholesterol Bilirubin. Sodium Potassium Chloride Calcium and Phosphorus
7	**Major Tests:** Glucose Tolerance Test Insulin Tolerance Test Gastric Analysis Xylose Absorption Test Clearance Test for Renal function Enzyme Acid and Alkaline Phosphates
8	**Quality Control of Clinical Investigations:** Automation in Clinical Biochemistry Laboratory Organization Management and Maintenance of records

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Biochemistry – Question and Answers. Author : U. Sitaram Acharya.
B. Biochemistry. Author : U. Satayanaran.
C. Practical Biochemistry. Author : Sheel Sharma.
D. Clinical Chemistry. Author : M.N. Chatterjee.
E. A text book of medical biochemistry. Author : S. Ramakrishan and R. Ranjan.

BLOOD BANKING- BBN14301

UNIT	CONTENTS
1.	**Blood Grouping:** Human Blood Group System ABO Subgroups Red Cell Antigen Natural Antibodies Rh System Rh Antigens and Rh Antibodies Hemolytic Disease of Newborn and Prevention Principal of Blood grouping, antigen-antibody reaction Agglutination, Hem agglutination, Condition required for antigen antibody reaction. Blood grouping techniques. Cell grouping, Serum grouping. Methods for ABO grouping- Slide and Tube Method Cell grouping and Serum grouping Rh grouping by slide and Tube method. Difficulties in ABO grouping- Rouleaux formation and its interference with Blood grouping. Auto Agglutinins Antiserum used in ABO test procedures—Anti–A, Anti–B, Anti-AB Antiserum Inheritance of the Blood groups Control, A&B Cells preparation, Auto Control Medical Application of Blood Groups
2.	**Blood Transfusion:** Principal and Practice of blood Transfusion Blood Transfusion service at District level Guide Lines for the appropriate use of Blood and Quality Assurance Antilogous Blood Transfusion Practices Quality Assurance in Blood Transfusion Services- Standard operating procedures for usage, Donation and storage of Blood Screening of Donor Compatibility testing Safety and Procurement of supplies
3.	**Blood Donation:** Blood donor requirements Criteria for selection and rejection Medical history and personal details Self-exclusion Health checks before donating blood. Screening for TTI
4.	**Blood Collection:** Blood collection packs Anticoagulants Taking and giving sets in Blood Transfusion Techniques of collecting blood from a Doctor Instructions given to the donor after Blood Donation Adverse donor reaction
5.	**Testing Donor Blood:** Screening donor's blood for infectious agents – HIV, HCV, HBV, Treponema palladium Plasmodium, HTLV.

	Bacterially Contaminated Blood.
6.	**Blood Donor Records:** Blood Donation record book Recording results Blood donor card
7.	**Storage and Transport:** Storage of blood Changes in blood after storage Gas refrigerator Lay out of a blood bank refrigerator Transportation
8.	**Maintenance of Blood Bank Records:** Blood bank temperature sheet Blood bank stock sheet Blood transfusion request form
9.	**Compatibility Testing:** Single tube compatibility techniques using AHG reagent Emergency compatibility testing Difficulties in cross matching Labeling and Issuing Cross – Matched Blood
10.	**Blood Components:** Collection of Blood Components for fractional transfusion Platelets packed Red Cell, Platelet Rich Plasma, Platelets Concentrate Preparation of concentrated (packed) Red Cells Techniques of preparation
11.	**Blood Transfusion Reactions:** Investigation of a Transfusion reaction Hemolytic transfusion reaction Actions to take when transfusion reaction occurs Blood grouping & Cross Matching
12.	**Special haematological tests for Blood Related Disease:** LE Cell Preparation various methods of its demonstration Homeostatic mechanism and theories of blood coagulation Physiochemical properties of coagulation factors Screening coagulation procedures Quantitative assay of coagulation factors Abnormal hemoglobin and their means of identification and estimation Haemocrit value by macro and micro methods their merits and demerits Compatibility test in blood transfusion complications and hazard of blood transfusion Preparation of packed cells and various fractions of blood for transfusion purposes.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Modern Blood Banking & Transfusion Practices by Denise Harmening-F.A. Davis Company; 5 edition (March 14, 2005)

APPLIED MICROBIOLOGY- MBL14307

UNIT	CONTENTS
1.	**Management and Planning:** Managing Reception Recording of specimen Cataloguing and indexing maintenance of laboratory records Maintenance of the various equipments and glassware
2.	**Sterilization:** Methods of Sterilization and their uses- Chemical Dry heat Steam sterilization Tantalization Filtration Sterilization by ultra-violet light Care and use of microscope Dark ground illumination Fluorescence and microscopy,
3.	Common bacteriological staining techniques
4.	Cultural Methods
5.	Systemic Bacteriology.
6.	Methods employed in identifying an unknown organism.
7.	Elementary knowledge of common pathogens.
8.	**Technique oriented examination of specimens** Pus Urine Stool Sputum Throat Swab
9.	**Diagnosis of Common Parasites.**
10.	**Introduction to Virology Techniques.**
11.	**Serological Methods:** Methods of performing agglutination Complement fixation Precipitation test General knowledge of antigen antibody reactions
12.	**Virology:** General morphology and ultra structure of Viruses Cupids- Helical Symmetry, Icosahedra symmetry and complex symmetry. Envelope- Glycoprotein and Matrix protein. Viral Genome- Their types and structure. Cultivation of Viruses in embrocated 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 assay Serological Methods- Hem agglutination, Hem agglutination inhibition, Complement fixation, Immune fluorescence assays (IFA) ELSIA, RIA. Plant Viruses- Recent advances in classification of plant viruses. Life sciences and other details of TMV and mosaic virus, potato virus X. General idea about Cyanophages, Actinophages and Mycoviruses Bacteriophages- Classification, Morphology and ultrastructure One step growth curve (Latent period, Eclipse period and burst size) Life cycle- Lytic and Lysogenic cycles of bacteriophages Animal Viruses- Classification and nomenclature. Life cycles and other details of DNA Viruses- Herpes, Adeno and SV40. Life cycle and other details of RNA viruses- Retroviruses, Oncogenic viruses and antiviruses (HIV), Picorna, Ortho myxo and Paramyxo virus.
13.	**Immunology:** Immune response- Immunity, Type (Innate and adaptive immune response). Organs of Immune System- Primary and Secondary Iymphoid organ. Ontogeny and Phylogeny of Lymphocytes- T and B Lymphocytes, Null. Cell of Immune System- Mononuclear cell and granulocytes, Antigen presenting cell. Antigen, Heptanes; Factors effecting immunogenicity, epitopes (Properties of it). Antibodies- Structure, Types and function. 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 and affinity measurement. Hypersensitivity- Definition, factor causing hypersensitivity Common hypersensitivity reaction, types, classification based on the time taken for reaction Auto Immune Disease. Immunodiagnostics- Precipitation techniques, Agglutination, Fluorescence techniques ELISA, RIA. Double diffusion and Immune-electrophoresis. Immunodiagnostics- VDRL test, Widal test, RA factor, Blood grouping, Rh typing, and Comb's test.
14.	**Bacteriology:** Introduction, history and scope of microbiology Contribution of Anatomy- Von Leeuwenhoek, Louis Pasteur. Alexander Fleming in the development of Microbiology. Morphology and ultra structure of bacterial cell wall of eubacteria and archaebacteria Cell Membranes – Structure, Composition and Properties. Bacterial Nutrition- Nutritional groups, Common nutritional requirements, Growth factors

	Growth of bacteria under extreme conditions- Psychrophiles, Thermopiles, Halophiles and Acidophilus. Bacterial Reproduction- Binary fission and endospore formation. Mycoplasmas- General characteristics, Structure and Reproduction. Cyan Bacteria- General characteristics, Structure, Reproduction and economic importance. Bacterial growth curve, generation time, growth Kinetics – Synchronous, Batch and continuous cultures Measurement of growth and factors affecting growth.
15.	**Microorganisms:** Chemical control of microorganisms- Heat, Filtration and radiation. Sterilization of soaps, detergents and dyes. Chemical Control of Microorganisms- Halogens, Phenol and Phenolic compounds, Heavy metals, Alcohols, Ethylene oxide, Aldehydes and Hydrogen peroxide.
16.	**Classification and salient features of bacteria**
17.	**Kingdom Fungi:** Structure and reproduction Classification of fungi General characteristics and life cycle of: Zygomycetes, Ascomycetes. Basidiomycetes and Deuteromycetes.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

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

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

CLINICAL BIOCHEMISTRY – BCH14305P

UNIT	CONTENTS
1	Practical I- Introduction to commonly used apparatus, Chemical and electronic balances in the laboratory. Preparation of standard solution using normality, Morality and Modality concepts. Maintenance of various types of glassware and apparatus in the laboratory. Use of pH meter and recording Ph of Water, Urine, Serum, Milk and Fruit juices. Simple acid base filtrations.
2	Practical II- Colour reactions of Carbohydrates, Lipids and Proteins and Bimolecular of medical importance. Demonstration and working of pH meter, Analytical balance, pH meter, Colorimeter, pH meter etc. Estimation of Capillary Blood Glucose level by use of Glucometer.

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. http://nsdl.niscair.res.in/bitstream/123456789/691/1/ClinicalBiochem_Concepts.pdf
B. http://www.sciencedirect.com/science/journal/00099120

BLOOD BANKING – BBN14301P

UNIT	CONTENTS
1	Practical I- LE Cell Preparation various methods of its demonstration Homeostatic mechanism and theories of blood coagulation Physiochemical properties of coagulation factors Screening coagulation procedures Quantitative assay of coagulation factors
2	Practical II- Abnormal hemoglobin and their means of identification and estimation Haematocrit value by macro and micro methods their merits and demerits Compatibility test in blood transfusion complications and hazard of blood transfusion Preparation of packed cells and various fractions of blood for transfusion purposes

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. http://www.bbguy.org/education/notes/BBPrac.pdf
B. Blood Banking Transfusion Medicine: Basic Principles & Practice by Christopher D. Hillyer, Elsevier Books, Oxford, 2003

APPLIED MICROBIOLOGY- MBL14307P

UNIT	CONTENTS
1	Practical I- Lab. Maintenance- The reception and recording of specimen Cataloguing and indexing Maintenance of laboratory records A knowledge of working and maintenance of the Incubators, Refrigerators, Water Baths, Ovens, Steamers, Auto Claves, Inspector, Centifuges, Vacuum Pumps and Water Steel. Cleaning and Sterilization of Syringes and Needles, Simple glass wares
2	Practical II- Sterilization- Methods of sterilization and their uses.

	Chemical, dry heat, steam sterilization, Tantalization, filtration, sterilization by ultra-violet light, card and use of microscope. Dark ground illumination, fluorescence and microscopy Common bacteriological staining techniques, Culture Methods. Systemic Bacteriology. The general principles of the methods employed in identifying an unknown organism. Elementary knowledge of common pathogens. Technique oriented examination of specimens such as Pus, Urine, Stool, Sputum, Throat swab, Parasitological techniques and elementary knowledge of life cycle and lab. Diagnosis of common parasites. Introduction to virology techniques.
3	Practical III- Serological Methods. Methods of performing agglutination Complement fixation, Precipitation test. General knowledge of antigen antibody reactions. Mycology as related to Candida and Dermatophytes. Preservation and Maintenance- Methods of preservation of cultures, maintenance of stock cultures. Disposal of infected material and culture media. Principles of serological techniques used in virology-HA,HA Had SRH, RPHA, IHA, CFT, CIEP Mode of transmission of viral agents.
4	Practical IV- 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, ASLO, CRP, RF, Elisa, Skin tests Demonstration of Casoni's test, MT test.
5	Practical V- Mycology Practical- KOH & LPCB Preparation Staining Techniques Culture of Fungi Slide Culture Basic Identification techniques.
6	Practical VI- Virology Practical- Preparation of glassware for tissure cultures (washing, strillsation) Preparation of buffers like PBS, Hank's Preparation of clinical specimens for isolation of viruses Collection & transport of specimens Serological tests-ELISA for HIV & HBs Ag etc. Chick Embryo techniques-Inoculation and Harvesting Handling of mice, rats and guinea pigs for collection of blood Molecular techniques in virology

LEARNING SOURCE: Self Learning Materials

ADDITIONAL READINGS:

A. Practical Microbiology by R.C. Dubey, D.K. Maheshwari, S. Chand & Company Limited, 2002

B. Practical Microbiology by Arora D.R., Bharti Arora, CBS Publishers & Distributors 2Rev Ed edition, 2007

HOSPITAL TRAINING-III-TRN14301