

## BACHELOR OF MEDICAL LAB. TECHNOLOGY – BMLT

Eligibility	:	Senior Secondary Level Examination (PCB)
Programme Duration	:	3 Years
Programme Objectives	:	<p>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.</p>
Job Prospects	:	<p>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.</p> <p>Common job profiles of students after completing BMLT include:</p> <p>Senior Technician in Blood Banks, Hospitals, Nursing Homes and Diagnostic Labs.</p>

**YEAR I**

Course Code	Course Title	Theory/ Practical	Continues Assessment (Internals)	Credits
ANT14104	Human Anatomy and Physiology – I	70	30	4
MBL14108	General Microbiology	70	30	4
PAT14101	Pathology	70	30	4
GCH14106	General Biochemistry	70	30	4
CSC14105	Fundamentals of Computer Science	70	30	4
ENG14102	Communication for Professionals	70	30	4
ANT14104P	Human Anatomy and Physiology – I (P)	35	15	2
MBL14108P	General Microbiology (P)	35	15	2
PAT14101P	Pathology (P)	35	15	2
GCH14106P	General Biochemistry (P)	35	15	2
<b>TOTAL</b>			<b>800</b>	<b>32</b>

**YEAR II**

Course Code	Course Title	Theory/P ractical	Continues Assessment (Internals)	Credits
ANT14202	Human Anatomy and Physiology-II	70	30	4
MBL14215	Bacteriology, Immunology and Parasitology	70	30	4
BCH14212	Clinical Biochemistry	70	30	4
BBN14201	Hematology and Blood Banking	70	30	4
MED14201	Community Medicine	70	30	4
PHM14202	Basic and Clinical Pharmacology	70	30	4
ANT14202P	Human Anatomy and Physiology-II (P)	35	15	2
MBL14215P	Bacteriology, Immunology and Parasitology (P)	35	15	2
BCH14212P	Clinical Biochemistry (P)	35	15	2
BBN14201P	Hematology and Blood Banking (P)	35	15	2
<b>TOTAL</b>			<b>800</b>	<b>32</b>

**YEAR III**

<b>Course Code</b>	<b>Course Title</b>	<b>Theory/ Practical</b>	<b>Continues Assessment (Internals)</b>	<b>Credits</b>
PAT14301	Histotechnology	70	30	5
MBL14310	Virology, Mycology and Applied Microbiology	70	30	5
PHM14301	Essentials of Medical Pharmacology	70	30	4
PAT14302	Histopathology and Cytopathology Techniques	70	30	5
MLT14301	Biomedical Techniques, Lab Management and Ethics	70	30	5
MBL14310P	Virology, Mycology and Applied Microbiology (P)	35	15	3
PAT14302P	Histopathology and Cytopathology Techniques (P)	35	15	3
TRN14301	Hospital Training	100		2
	<b>TOTAL</b>	<b>700</b>		<b>32</b>

## 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

## HUMAN ANATOMY AND PHYSIOLOGY – I – ANT14104

UNIT	CONTENT
<b>SECTION A – ANATOMY</b>	
1.	<p><b>Introduction: Human Body as a Whole:</b> Brief introduction about living system; General Anatomy-Definition of anatomy, and its divisions; Brief history of anatomy; Terms of positions, planes relationship and movements; Body regions; Body cavities; Membranes – Cutaneous, Serous, Mucous And Synovial membranes; Some clinical terms used in anatomy; General histology: definition, Electron microscopic structure of Human cell; Tissues-Classification, functions and Microscopic Structures of Primary tissues -Epithelial tissue, connective, tissue, muscular tissue &amp; Nervous tissue; Glands- Classification, microanatomy of serous &amp; mucous glands with examples.</p>
2.	<p><b>Skin and Fasciae:</b> Skin: Definition of Skin, Layers of skin, Types of skin, Appendages of skin –Hair, Sebaceous gland, Sweat gland, Nails, Receptors, Functions, Lines of cleavage, Skin phototype, Anatomy of aging skin, Applied aspects of skin-Albinism, Skin cancer etc; Fasciae: Definition, Types of fasciae –Superficial &amp; Deep, Modifications of deep fascia, Functions; Brief discussion over- Deep cervical fascia of neck, Thoracolumbar fascia, Pelvic fascia, Fascial compartments in the body.</p>
3.	<p><b>Locomotion and Support:</b> Skeletal System - Brief introduction about skeletal system, Organizations of skeleton, Functions of Skeleton; Bones - definition, Classification of bones, constituents of bone and bone tissue, Bone development and growth - Intramembranous Bones &amp; Endochondral Bones, Bone growth, Bone remodeling, Microscopic Structure of compact bones, Brief study on individual bones; Axial skeleton &amp; appendicular skeleton - Clavicle, Scapula, Humerus, Radius, Ulna, carpals, metacarpals, phalanges, Hip bones, pelvic bones, Sacrum, femur, tibia, fibula, tarsals, metatarsals and phalanges; sternum and ribs; Skull bones - Importance of sutures: coronal, saggital and lamboid, cranial fossae, foramen magnum, Bones of Cranium, Auditory meatus, Mandible and Maxilla. Difference between foetal and adult skull, Structure of typical &amp; atypical vertebrae, applied anatomy of bones; Cartilage - definition and its classifications, applied anatomy of cartilage; Joints - Definition, Classification of joints with examples, Synovial joint, Movements &amp; mechanism of Joints, Mechanical axis of a Bone and movement of a Bone, Joint positions, Limitation of Movement, Applied aspects - Arthritis, Spondylitis, Neuropathic Joint, etc.</p> <p>Muscular system – Definition, Classification of muscular tissue, Characterization of – Skeletal, Smooth &amp; Cardiac muscles, Names, origin, insertion, nerve supply &amp; action of Skeletal muscles of the body; Appendicular muscles - General overview about muscles that move -a) Pectoral Girdle b) Shoulder Joint c) Elbow Joint d) Wrist Joint e) Intrinsic Muscles of Hand f) Muscles of Hip, Thigh, Leg and Intrinsic Muscles of Foot; Axial muscles - General overview about muscles of - a) Respiration- Diaphragm and Intercostals; b) Abdominal Muscles; c) Muscles of Facial Expression; d) Muscles of Mastication; e) Muscles of Head and Neck.</p> <p>Histology of - Compact bone (TS &amp; LS), 3 types of cartilage &amp; skeletal (TS &amp; LS), smooth</p>

	& cardiac muscle.
4.	<b>The Cardiovascular System:</b> General considerations about basics of Cardiovascular System; Gross anatomy & related applied aspects of Heart – Location, Mediastinum, Shape and Size, Pericardium, Chambers, Exterior & Interior, Blood supply of heart, Systemic & pulmonary circulation, Conducting system of heart; Major arteries - Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse; Major veins - Inferior vena cava, portal vein, portosystemic anastomosis, cephalic vein, Great saphenous vein; Histology of – Elastic Artery, Muscular Artery & Vein.
5.	<b>The Lymphatic System:</b> General consideration of Lymphatic system; Gross anatomy of - Cisterna Chyli & Thoracic Duct; Brief discussion over names of regional lymphatics, axillary and inguinal lymph nodes; Histology of – Lymph Node, Spleen, Tonsil & Thymus.
6.	<b>The Respiratory System:</b> Definition and general consideration; Gross anatomy & related applied aspects of – Parts of Respiratory System - Nose; Nasal Cavity; Larynx; Trachea; Lungs; Bronchopulmonary Segments; Pleura; Names of Paranasal Air Sinuses; Histology of - trachea and lung.
7.	<b>The Gastro-intestinal System:</b> Definition and brief introduction; Gross anatomy & related applied aspects of – Parts of GIT, Oral cavity (Lip, Tongue, Tonsil, Dentition); Salivary glands- types, location, structure and function; Waldeyer's ring; Pharynx- muscles, action and their nerve supply; Oesophagus, Stomach, Small and Large Intestine, Liver, Gall Bladder and Pancreas; Histology of – Tongue, Oesophagus, stomach, small and large intestine, liver, gall bladder & pancreas.
8.	<b>Peritoneum:</b> Description in brief about:-Structure of Peritoneum; Types; Function; Structures formed by Peritoneum - Omenta, Mesenteries, Ligaments, folds, fossas and pouches; Clinical significance; Peritoneal dialysis.
<b>Section B – Physiology</b>	
1.	<b>Introduction on Physiology:</b> Cell - the unit of life; Description of a cell and its components; Ion channels, receptors and carriers; Intercellular connections; intercellular communications; Functions of a cell; Movement of substances and homeostasis – movement of substances within the body, homeostatic control systems; Basics about different organs and systems.
2.	<b>Blood, Lymphatic System &amp; Immunity:</b> Blood volume - Determination of blood volume, Variation and maintenance of blood volume, Properties of blood; The Plasma - Composition and character, Functions of plasma proteins; The Erythrocytes – Erythropoiesis, Functions, Fragility of RBCs, Erythrocyte sedimentation rate (ESR); Haemoglobin - structure, types, compounds of haemoglobin, abnormal haemoglobin, RBC indices - PCV, MCV, MCH, MCHC, Colour index. Anaemia - Types with examples; Polyeythaemia; Leukocytes – Types, morphology, leucopoiesis, functions; Immunity - Humoral & cellular, mechanism of immune response, immunoglobulins; Haemostasis - Platelets: structure and functions, Role of platelets, Blood coagulation, anticlotting mechanisms, anticoagulants; Bleeding disorders - Purpura, Hemophilia, Vitamin K deficiency, tests for bleeding disorders. Blood group and blood transfusion - Blood group: different systems, Blood grouping & cross matching and clinical importance. Blood transfusion: Hazards of blood transfusion, storage of blood; Homeostatic imbalances – Sickle-Cell disease, Leukemia; Clinical Connection - Withdrawing Blood, Bone Marrow Examination, Medical Uses of Hemopoietic Growth Factors, Iron Overload and Tissue Damage, Reticulocyte Count, Complete Blood Count, Anticoagulants - Aspirin and Thrombolytic Agents, Hemolytic Disease of the Newborn; Lymph – lymphoid tissue formation, composition and function of lymph; Clinical connection - Metastasis through lymphatic vessels, Microbial evasion of phagocytosis, Abscesses and Ulcers, Cytokine therapy; Homeostatic imbalances – AIDS, Autoimmune diseases.
3.	<b>Gastrointestinal System:</b> Characteristics of G.I wall; Neural control of G.I function; G.I. Hormones; Saliva - Composition, Functions, control of secretion; Gastric juice - Composition, mechanism of secretion, functions, regulation of secretion, mucosal barrier; Pancreatic juice - Composition, functions, regulation; Liver & Gall Bladder: Composition & functions of bile, control of secretion, functions of gall bladder, gall stones, enterohepatic

	circulation, jaundice, functions of liver & L.F.T; Small intestine - Composition & regulation of secretion and functions of intestinal juice; Large intestine - Functions, Digestion & Absorption; Movements of GI tract; Homeostatic imbalances - Peptic ulcer disease, colorectal cancer, Hepatitis; Clinical connection - Gastro esophageal Reflux Disease, Pylorospasm and Pyloric Stenosis, Vomiting, Pancreatitis and Pancreatic Cancer, Appendicitis, Polyps in the Colon, Occult Blood.
4.	<b>Respiratory System:</b> Functions of respiratory system; Mechanics of respiration; Lung volumes and capacities - definition, normal values, their measurement and clinical importance; Pulmonary ventilation; alveolar ventilation; dead space; Diffusion of gases across alveocapillary membrane; diffusing capacity; Pulmonary circulation; Oxygen & carbon dioxide transport in blood; Pressure changes during ventilation, pressure volume relationship including surfactant and compliance, airway resistance; Control of respiration - neural control, chemical control, response to exercise, periodic breathing; Lung function tests; Homeostatic imbalances – Asthma, Chronic obstructive pulmonary disease, Lung cancer, Pneumonia, Tuberculosis, Cystic fibrosis; Clinical connection - Laryngitis and Cancer of the Larynx, Tracheotomy and Intubation, Respiratory Distress Syndrome, Hyperbaric Oxygenation, Carbon Monoxide Poisoning, Hypoxia, The Effect of Smoking on Respiratory Efficiency.
5.	<b>Nerve Muscle Physiology:</b> Electrical properties of cell membrane; Membrane Potential (MP); Development and maintenance of MP, Action Potential (AP); Physiology of nerves and neuromuscular junction; Neuro muscular transmission; Functional anatomy of skeletal muscle; Mechanism of muscle contraction and relaxation; isotonic & isometric contraction; energy sources and metabolism; motor unit; Involuntary muscles - Cardiac and smooth muscles; Homeostatic imbalances – Myasthenia gravis, Muscular dystrophy, Fibromyalgia; Clinical connection - Muscular Atrophy and Hypertrophy, Exercise-Induced Muscle Damage, Rigor Mortis, Electromyography, Hypotonia and Hypertonia, Anabolic Steroids.
6.	<b>Cardiovascular System:</b> Structure and properties of Heart muscles and nerve supply of Heart; Structure and functions of arteries, capillaries and veins; ECG - leads, principles of normal recording, normal waves & internal & their interpretations, clinical uses of ECG; Cardiac cycle and Heart sound; Factors affecting Heart Rate and its regulation; Cardiovascular reflexes; Blood pressure and its regulation; physiological variation; peripheral resistance; Factors controlling Blood Pressure; Haemorrhage & Shock; Homeostatic imbalances – Coronary artery disease, Coronary angiography, arrhythmias, Hypertension-Types, etiology & effects; Clinical connection - Cardiopulmonary Resuscitation, Pericarditis, Myocarditis and Endocarditis, Heart Valve Disorders, Myocardial Ischemia and Infarction, Artificial Pacemakers, Congestive Heart Failure.
7.	<b>Circulation:</b> Regional Circulation - Coronary circulation, cutaneous circulation, pulmonary, cerebral, renal circulation, Circulation through skeletal muscle, Lymphatic circulation.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Graaff, Kent Van de and et al, Schaum's Outline of Human Anatomy and Physiology: Fourth Ed. (2013), McGraw Hill Education.
- B. Clark, Robert K., (2005), Anatomy and Physiology: Understanding the Human Body, Jones and Bartlett Publishers.
- C. Shier David et al, (2012), Hole's Human Anatomy and Physiology, McGraw Hill Education.

**WEB LINKS:**

- A. <http://training.seer.cancer.gov/anatomy/respiratory/quiz.html>.
- B. <http://kidshealth.org/parent/general/body>.
- C. <http://www.innerbody.com/anatomy/respiratory>.

# **HUMAN ANATOMY AND PHYSIOLOGY – I (P) – ANT14104P**

1. Histology
  - a) Histotechniques
  - b) Microscope
  - c) Epithelium
  - d) Histology of Skeletal muscle
  - e) Histology of Cardiac muscle
  - f) Histology of Smooth muscle
  - g) Histology of Bone
  - h) Histology of Hyaline cartilage
  - i) Histology of Elastic cartilage
  - j) Histology of Fibrocartilage
  - k) Histology of artery
  - l) Histology of Vein
  - m) Histology of Lung
  - n) Histology of Trachea
  - o) Histology of Lymphnode
  - p) Histology of Spleen
  - q) Histology of Thymus
  - r) Histology of Tonsil
  - s) Histology of Tongue
  - t) Histology of Serous gland
  - u) Histology of Mucous gland
  - v) Histology of Oesophagus
  - w) Stomach (Fundus)
  - x) Histology of Stomach (Pylorus)
  - y) Histology of Duodenum
  - z) Histology of Jejunum
  - aa) Histology of Ileum
  - bb) Histology of Large intestine
  - cc) Histology of Appendix
  - dd) Histology of Liver
  - ee) Histology of Gall bladder
  - ff) Histology of Pancreas
2. Osteology
  - a) Appendicular skeleton
  - b) Axial skeleton
3. Specimen

- a) Heart
  - b) Lung
  - c) Larynx
  - d) Skin
  - e) Joint
  - f) Muscle
4. Introduction to Hematology.
  5. Blood Samples Collection.
  6. Introduction to Hematology.
  7. Blood Samples Collection.
  8. Estimation of Hemoglobin.
  9. Determination of Hematocrit.
  10. Hemocytometry - The Neubauer's Chamber.
  11. Hemocytometry - The Diluting Pipettes.
  12. Total RBC Count.
  13. Determination of Red Blood Cell Indices.
  14. Total Leukocyte Counts.
  15. Staining of Peripheral Blood Smear & Differential Leukocyte Count (DLC).
  16. Determination of Arneeth Count.
  17. Absolute Eosinophil Count.
  18. The Reticulocyte.

### **GENERAL MICROBIOLOGY – MBL14108**

UNIT	CONTENT
1.	<p><b>Introduction to Microbiology and Microbial Genetics:</b> Introduction &amp; brief history of microbiology; Scope &amp; relevance of microbiology; The golden age of microbiology; Modern developments in microbiology; The microbial role in disease; The discovery of microbial effects; Introduction &amp; concept of genetics; Definition of terminology- genetics, genome, gene, chromosome, base pairs, genetic code, genomics, genotype, phenotype; Basic principles of DNA &amp; RNA structure &amp; steps of protein synthesis; Brief introduction on mutation; Types of mutation; Genetic transfer &amp; recombination; Brief aspect on plasmids; Types of bacterial variation- genotypic &amp; phenotypic variation; Brief aspect of genetic engineering &amp; its application.</p>
2.	<p><b>The Bacteria-Bacterial Taxonomy:</b> Introduction to bacterial taxonomy; Taxonomic classification of organisms; Meaning and definition of taxonomy &amp; classification; Description on Binomial nomenclature; Meaning and definition of eukaryotic cell &amp; prokaryotic cell; General property of bacterial cell.</p> <p><b>Morphology and Physiology of Bacteria -</b> Introduction of bacteria, Classification of bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, Definition &amp; functions of cell wall, Bacteria with defective cell wall (protoplast, spheroplast &amp; L-forms), Cellular components in bacteria in detailed aspect (cytoplasmic membrane, Cytoplasm, intracytoplasmic inclusions, mesosomes, ribosomes slime layer, capsule, flagella, spore).</p>



3.	<b>Growth &amp; Multiplication of Bacteria:</b> Meaning of growth of bacteria; Types of bacterial growth with definition of generation time; Growth form in laboratory; Definition of growth curve including its phases; Multiplication of bacteria; Factors that affect growth-energy requirement, oxygen; requirement & metabolism, carbon dioxide requirement, temperature, pH, light & osmotic effect; Definition of Psychrophilic & thermophiles bacteria.
4.	<b>Stains used in Microbiology:</b> Introduction of stain; Importance of stain in microbiology; Types of stain in detailed giving example- Simple stain, differential stain, negative stain, impregnation method; Special staining for certain bacteria, bacterial spores, parasites & fungi; Principle, procedure, application & result interpretation of Gram staining & Ziehl Neelsen staining.
5.	<b>Bacteriological Media &amp; Culture Techniques:</b> Introduction of culture media; Basic requirements & uses of culture media; Classification of culture media: Based on their consistency (solid, liquid, semisolid), Based on constituents/ingredients (simple, complex, synthetic or defined, special), Based on Oxygen requirement (aerobic & anaerobic media); Indication of culture media; Types of culture methods (streak culture, stab culture, pour plate method, broth culture); Anaerobic culture methods: Displacement Method, Chemical or biological method, Reduction of Oxygen; Automated methods (Bactec- blood culture method).
6.	<b>Methods of Identification of Bacteria:</b> Brief introduction of how bacteria is identified in pure culture; Identification of the bacterium by staining reactions; Identification of the bacterium by cultural characteristics; Identification by fermentation & other biochemical properties (Sugar fermentation, Litmus milk, Indole production, Methyl Red test (MR), Voges Proskauer test (VP), Citrate utilization test, Nitrate reduction, Production of ammonia, Urease test, Triple Sugar Iron medium); Pathogenicity test into laboratory animals.
7.	<b>Pathogenesis of Infectious Diseases:</b> Introduction of microbes & related terms (commensals, pathogen, opportunistic pathogens, pathogenicity, and virulence); Definition of infection; Types of infection; Routes of infection: Reservoir, Mode of transmission, The susceptible host; Sources of infection: Endogenous sources, Exogenous sources; Factors predisposing to microbial pathogenicity; Types of infectious diseases: Localised, Generalised.
8.	<b>Methods to Control Microorganism:</b> Introduction & definition of sterilization, disinfection, antiseptics, bactericidal agents, bacteriostatic agents and decontamination; Methods of sterilization: Physical agents – sunlight, drying, filtration, radiation, ultrasonic and sonic vibrations; Types of drying: dry heat (flaming, incineration, hot air) & moist heat (pasteurization, boiling) - Chemical agents- alcohols, Aldehydes, dyes, halogens, phenols, surface active agents, metallic salts, gases; Control of sterilization- physical, chemical & biological control; Types of disinfectant; Testing of disinfectants- Rideal Walker test & Chick Martin test.
9.	<b>Anti-microbial Agents &amp; Sensitivity Testing:</b> Introduction of antimicrobial agents & sensitivity testing; Meaning, definition of anti-microbial agents; Ideal qualities of an antimicrobial agent; Mechanism of action of anti-microbial drugs; Resistance of bacteria to antimicrobial drugs; Definition of antimicrobial sensitivity testing; Measurement of anti-microbial activity techniques; Factors affecting anti-microbial activity in vitro; Quality assurance in antibiotic susceptibility testing with control strains.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Pelczar Mj, Chan ECS, Kleig NR. 1993. Microbiology, Tata McGraw Hill.
- B. LM Prescott, 2002. Microbiology, 10<sup>th</sup> ed. McGraw Hill.
- C. Stuart Hoggy, 2005. Essential Microbiology, Wiley.

**WEB LINKS :**

- A. [http://www.angelfire.com/pro/sak3002\\_assign/history\\_microbiology2.html](http://www.angelfire.com/pro/sak3002_assign/history_microbiology2.html).
- B. [http://en.wikipedia.org/wiki/Genetic\\_engineering](http://en.wikipedia.org/wiki/Genetic_engineering).

## **GENERAL MICROBIOLOGY (P) – MBL14108P**

1. Staining Techniques.
2. Media for Routine Cultivation of Bacteria.
3. Culture Techniques.
4. Control of Microbial Growth.
5. Antibiotic Susceptibility Test.

## **PATHOLOGY – PAT14101**

UNIT	CONTENT
1	<b>Introduction to Pathology:</b> Introduction and scope of Pathology; Brief resume of Historical Aspects; Subdivisions of Pathology; Ethical aspects of Pathology practice.
2	<b>Techniques for Studying Pathology:</b> Basic concepts of Microscope, cryostat, Flow cytometry & PCR.
3	<b>Cell Structure, Injury and Cellular Adaptations:</b> Cell morphology, mitosis of resting cell and its mechanism, correlation to cell structure and function; Cell Injury: etiology and pathogenesis of physical and chemical cell injury, morphology of cell injury; Cell death: Discussion over – Autolysis, Necrosis, Apoptosis and Gangrene.
4	<b>Inflammation &amp; Healing:</b> Inflammation - Types, Cells and mediators involved; Types - Acute inflammation, Pathological features, vascular and cellular events, Morphologic variants of acute inflammation, inflammatory cells and Mediators; Chronic Inflammation: Causes, Types, Classification - nonspecific and granulomatous with examples; Repair & Wound healing - Types by primary and secondary union, factors Promoting and delaying the process; Healing in specific site including bone healing.
5	<b>Haemodynamic Disorders:</b> Hyperemia, Ischemia and Haemorrhage in detail; Edema: Etiology, Pathogenesis and types; Chronic Venous Congestion: of particular organs: Lung, Liver, Spleen- Causes, Pathogenesis, Gross features and microscopic features; Thrombosis and Embolism: Formation, Fate and Effects; Infarction: Types, Common sites, Pathogenesis, Gross and microscopic features of particular organ; Shock: Pathogenesis, types, morphologic changes/ features.
6	<b>Nutritional &amp; Infectious Diseases:</b> Nutritional Diseases - Definition and brief discussion; Protein energy malnutrition - Marasmus, Kwashiorkor, and Vitamin deficiency disorders; Classification with specific examples; Disorders of Mineral metabolism such as a) zinc, b) calcium. Infectious Diseases - Bacterial diseases: Pyogenic, Typhoid, Diphtheria, Gram negative infection, Bacillary dysentery, Rickettsia, Chlamydial infection; Viral diseases: Poliomyelitis, Herpes, Rabies, Measles, HIV infection, Fungal disease and opportunistic infections, Parasitic diseases: Malaria, Filariasis, Amoebiasis, Kala-azar, Cysticercosis, Hydatid cyst.
7	<b>Neoplasia:</b> Definition, Classification, Histogenesis, Biologic behavior; Types - Benign and Malignant, differences between carcinoma and sarcoma; Precancerous lesions - Types, examples; Carcinogenesis - Types of carcinogens-Environmental carcinogens, chemical, viral, occupational; Cellular oncogenes and prevention of cancer; Diagnostic Methods in cancer – Exfoliative Cytology & FNAC; Tumour and host interactions - Systemic effects including paraneoplastic syndromes, cachexia, tumour immunology.
8	<b>Genetic &amp; Pediatric Disorders:</b> Basic concepts of genetic disorders and some common

	examples and congenital malformation; Specific genetic diseases - Cause, basic genetic defect and pathological features of Down's syndrome, Turner's syndrome, Klinefelter's syndrome, and Storage disorders.
9	<b>Body Fluids Examination:</b> Brief discussion; Urine examination - routine physical, chemical and microscopic examination of urine - method of collection, normal constituents, physical examination & chemical examination; Stool examination - routine, naked eye and microscopic examination of stool and study of parasitic ova and cysts in the stool: method of collection, normal constituents & appearance, abnormal constituents; CSF examination - physical, chemical and microscopic examination, cell count and staining; Semen analysis - collection & examination; Sputum examination - collection and examination, examination of malignant cells in the sputum, stains commonly used to detect bacteria in sputum gram staining; Ziehl-Neelsen staining, Mantoux test in Mycobacterium tuberculosis; examination of pleural, pericardial and ascetic fluids.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Porter R 1<sup>st</sup> ed. (1997) The greatest benefit to mankind: a medical history of humanity from antiquity to the present. HarperCollins, London.
- B. Rosai J 1997 Pathology: a historical opportunity. American Journal of Pathology 151:3-7.
- C. Muir's Textbook of Pathology 15<sup>th</sup> ed.

**WEB LINKS :**

- A. [www.news-medical.net/health/Types-of-Pathology.aspx](http://www.news-medical.net/health/Types-of-Pathology.aspx).
- B. [www.wisegeek.com/what-are-the-different-pathologist-careers.htm](http://www.wisegeek.com/what-are-the-different-pathologist-careers.htm).
- C. [www.sikluv-ustav-patologie.patologie.cz/vyuka/Cell-injury-death.doc](http://www.sikluv-ustav-patologie.patologie.cz/vyuka/Cell-injury-death.doc).

**PATHOLOGY (P) – PAT14101P**

1. The Microscope.
2. Histopathology Techniques and Routine Staining.
3. Frozen Section and Special Stains.
4. Urine Examination I: Physical and Chemical.
5. Urine Examination II: Microscopy.
6. Semen Examination.
7. Examination of CSF.

**GENERAL BIOCHEMISTRY – BCH14106**

UNIT	CONTENT
1	<b>General Biochemistry:</b> Elementary knowledge of inorganic chemistry; Structure of atom, atomic weight, molecular weight and equivalent weight; Acids, bases and salts; pH indicators - pH meter - pH measurement; Molar solutions; Normal solutions; Buffer solutions; Percent solution; Saturated solution; Standard solutions; Elementary knowledge of organic chemistry (Organic compounds, aliphatic, aromatic, alcohol, ethers, phenols, acids etc.); Elementary knowledge of Physical Chemistry; Osmosis, osmotic pressure, diffusion, hypotonic, hypertonic and isotonic solutions; Definition and classification of some Colloids and crystalloids.

2	<b>Elementary Knowledge of Analytical Chemistry:</b> Principles, Instrumentation, working, uses, care, Maintenance; Balances - mono-pan, two-pan, top-pan; Centrifuges; pH meter; Colorimeter; Spectrophotometer; Fluorimeter; Flame-photometer; Ion selective electrodes; Urinometer; Chromatograph; Electrophoresis; Densitometer.
3	<b>Carbohydrates:</b> Dietary Sources; digestion; absorption; basic metabolism; regulation of blood glucose & its importance; glucose tolerance test; glycosylated Hb; other parameters and related disorders.
4	<b>Proteins &amp; Nucleic Acid:</b> Dietary sources; digestion; absorption; fate of amino Acids; nitrogen equilibrium; formation and detoxification of ammonia; formation of urea; formation of non protein nitrogenous products e.g. uric acid, creatinine; disorders related to protein and nitrogen metabolism; Definition of DNA, Nucleic acids- structure of DNA- Watson & Crick model of DNA- Types of RNA.
5	<b>Lipids:</b> Dietary sources digestion; absorption; basic metabolism; lipid profile (cholesterol, triglyceride, lipoproteins, phospholipids) and its significance in various disorders.
6	<b>Vitamins, Minerals and Electrolytes:</b> Fat soluble and water soluble vitamins; vitamin deficiency; Na; K; Cl; Ca; Mg; I <sub>2</sub> ; P; Fe and iron binding capacity.
7	<b>Enzymes:</b> Classification; properties; factors affecting enzyme Activity; isoenzymes and coenzymes; Clinical enzymology - Therapeutic, diagnostic and analytical uses of enzymes with normal values of serum enzymes; Hormones - Chemical nature and biochemical functions.
8	<b>Therapeutic Drug Monitoring:</b> Barbiturate; Phenobarbital; Phenytoine; lithium; lead; salicylate; mercury; digitalist.
9	<b>Acid Base Balance:</b> Regulation of blood pH; Henderson Hasselbach equation; renal; respiratory and buffer system importance of arterial blood gases; Metabolic acidosis; Metabolic acidosis ; Metabolic alkalosis; Respiratory acidosis; Respiratory alkalosis; Basic Principles and estimation of Blood Gases and pH; Basic principles and estimation of Electrolytes.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Let's Review: Chemistry, the Physical Setting, By Albert S. Tarendash, 2008.
- B. Biochemistry, By Mary Campbell, Shawn Farrell, 7<sup>th</sup> Edition, 2012.
- C. Lehninger Principles of Biochemistry, David Lee Nelson, Albert L. Lehninger, Michael M. Cox, 2013.

**WEB LINKS:**

- A. [http://www.t.soka.ac.jp/chem/iwanami/inorg/INO\\_0001.pdf](http://www.t.soka.ac.jp/chem/iwanami/inorg/INO_0001.pdf).
- B. [http://books.google.co.in/books?id=J5NVrE\\_Uf-8C&printsec=frontcover&dq=biochemistry&hl=en&sa=X&ei=mCjfU8fjOcLc8AWM24KwAg&ved=0CBoQ6AEwAA#v=onepage&q=biochemistry&f=false](http://books.google.co.in/books?id=J5NVrE_Uf-8C&printsec=frontcover&dq=biochemistry&hl=en&sa=X&ei=mCjfU8fjOcLc8AWM24KwAg&ved=0CBoQ6AEwAA#v=onepage&q=biochemistry&f=false).

**GENERAL BIOCHEMISTRY (P) – BCH14106P**

1. Preparation of Primary standard: 1N Sodium Carbonate.
2. Preparation of 2/3N Sulfuric acid.
3. Preparation of 10g/dl Sodium Tungstate.
4. Preparation of Normal Saline (Quantity 1Lt).
5. Collection of blood.

6. Separation of serum from blood.
7. Separation of plasma from blood.
8. Demonstration of Vacutainers.
9. Demonstration of Colorimeter.
10. Demonstration of Spectrophotometer.
11. Demonstration of Flame photometer.

## **FUNDAMENTALS OF COMPUTER SCIENCE – CSC14105**

UNIT	CONTENT
1	<b>Computer Application:</b> Introduction to Computer - Advantages of computers, Limitations of computers, Application of Computer in Different Fields of Life, Computer Generations, and Classification of Computers; Characteristics of computers; Computer System; Input Unit; Output Unit; Central Processing Unit; Storage or Memory Unit - Primary Storage or Main Memory (MM), Memory Unit – Secondary Storage.
2	<b>Computer Organization:</b> Overview of Computer Organization; Central Processing Unit; Control Unit; Arithmetic Unit; Instruction Set - Difference between RISC and CISC; Register; Processor Speed - Higher is not Always Better, Keep-up with Technology, Price is not Everything.
3	<b>Memory:</b> Overview of Storage Devices; Main Memory; Storage Evaluation Criteria - Access Time, Memory Cycle Time, Effective Access Time; Memory Organization - Addressing Strategies, Organization of Memory Units, Content-Addressable Memories; Memory Capacity; Random Access Memories; Read Only Memory; Secondary Storage Devices; Magnetic Disk; Floppy and Hard Disk - Floppy disk drive, Hard Discs; Optical Disks CD-ROM - Compact disk, DVD, Blu-Ray disk, HD-DVD; Mass Storages Devices; and Differences between the Primary and Secondary Memory.
4	<b>Input Devices:</b> Keyboard; Mouse; Trackball; Joystick - Joystics in aviation, Joystics in Gaming, Analog Joystick, Digital Joystick; Scanner - Characteristics of a scanner, Types of scanner; Optical Mark Reader; Bar-code reader - Types of barcode; Magnetic Ink Character Reader (MICR); Digitizer; Card reader; Voice recognition; Web Cam; and Video Cameras.
5	<b>Output Devices:</b> Monitors - Characteristics of VDU, Types of VDU; Printers; Dot Matrix Printers; Inkjet Printers; Laser Printers; Plotters; Computers Output Micro Files (Com)- COM to CD Service, What Are the Benefits of COM?; Multimedia Projector - Criteria to evaluate suitable Projector.
6	<b>Operating System:</b> Microsoft Windows - An Overview of different version of windows, Basic Windows Elements, File Management through Windows 7; Using Essential Accessories - Disk Cleanup and Disk Defragmenter, Entertainment, Calculator, Note pad, Paint, Wordpad, Recycle Bin, Windows Explorer, and Creating Folder Icons.
7	<b>Word Processing:</b> Word Processing Concepts; Working with Documents - Create a New Document, Opening an Existing Document, Saving a Document, Renaming Documents, Working on Multiple Documents, Document Views, and Close a Document; Working with Text in Word - Selecting text, Editing Text, Finding and replacing text; Printing Documents; Formatting - Bullets and Numbering in Word, Alignment, Page designs and Layout, Editing and Proofreading; Working With Graphics - Inserting Clip Art Images, Moving Images in Word, Deleting images in Word, Text wrapping in Word, Creating Lines and Arrows in Word, Drawing Shapes in Word, Adding a Text Box; Working with Tables.
8	<b>Presentation Package:</b> Creating a New and Opening an Existing Presentation; Creating the look of your Presentation; Working with Slides - Adding and formatting Text, Formatting PowerPoint; Printing Handouts with Notes making; Images and Clip Art; Slide Shows.
9	<b>Internet and Email:</b> Definition about the World wide web & brief History; Use of Internet and Email – Internet, Email; Internet – Terminology, Protocols, Routing; Websites; The Mail Protocol Suite; Using Search Engine and beginning Google search; Exploring the next using

	Internet Explorer and Navigator; Uploading and Downloading of Files and Images; E-mail ID creation - Opening the E-mailbox, Sending Messages, and Attaching Files in E-mails.
10	<b>Hospital Information System:</b> Hospital Information System; Architecture of a Hospital Information System; Aim and Uses of HIS - Aim of HIS, Uses of HIS; Types of HIS; Benefits of using a Hospital Information Systems; Advanced Hospital Management System - XO Hospital Management System, LCS Hospital Management Information System, NVISH Hospital Management System.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Sunny Handa, "Fundamentals of Information Technology", LexisNexis Butterworths.
- B. Graeme G. Wilkinson, "Fundamentals of Information Technology", Wiley.
- C. Ramesh Bangia, "Computer Fundamentals and Information Technology", Firewall Media.

**WEB LINKS:**

- A. [http://oer.nios.ac.in/wiki/index.php/COMPUTER\\_ANT\\_ITS\\_COMPONENTS](http://oer.nios.ac.in/wiki/index.php/COMPUTER_ANT_ITS_COMPONENTS)
- B. [http://http://homepage.cs.uri.edu/book/cpu\\_memory/cpu\\_memory.htm](http://http://homepage.cs.uri.edu/book/cpu_memory/cpu_memory.htm).
- C. <http://uwf.edu/clemley/cgs1570w/notes/concepts-7.htm>

**COMMUNICATION FOR PROFESSIONALS – ENG14102**

UNIT	CONTENT
1	<b>Essentials of Grammar:</b> Parts of Speech; Vocabulary building; Sentence; Articles; Pronouns; Quantity; Adjectives; Adverbs; Prepositions, Adverb particles and phrasal verbs, Verb; Verb tenses; Imperatives; Active and passive voice; Direct and indirect speech; The infinitive; Conditional sentences; Synonyms and antonyms; Singular and Plural; Figures of Speech; Punctuation and Phonetics.
2	<b>Nature, Scope and Process of Communication:</b> Defining Communication; Nature of Communication; Objectives/Purpose of Communication; Functions of Communication; Process of Communication; Elements of Communication Process; Process of Communication: Models; Working of the Process of Communication; Forms of Communication.
3	<b>Channels and Networks of Communication:</b> Channels of Communication; Communication Flow in Organizations: Directions/Dimensions of Communication; Patterns of Flow of Communication or Networks; Factors Influencing Organizational Communication.
4	<b>Principles of Effective Communication:</b> Communication Effectiveness: Criteria of Evaluation; Seven Cs of Effective Communication; Four Ss of Communication.
5	<b>Barriers in Communication:</b> Categorisation of Barriers; Semantic Barriers; Organizational Barriers; Interpersonal Barriers (Relating to Superior-subordinate); Individual or Psycho-sociological Barriers; Cross-cultural/Geographic Barriers; Physical Barriers/Channel and Media Barriers; Technical Aspects in Communication Barriers; Overcoming the Barriers in Communication; Measures to Overcome Barriers in Communication.
6	<b>Non-verbal Communication:</b> Characteristics of Non-verbal Communication; Relationship of Non-verbal Message with Verbal Message; Classification of Non-verbal Communication.
7	<b>Oral Communication: Informal Conversation:</b> Oral Communication; Informal Conversation; Learning Informal Conversation; How to Go About Learning Other Tricks?; Learning Conversational Skills; Internet Chat.
8	<b>Communication in Business Organizations:</b> Meaning of Business Communication; Types of Information Exchanged in Business Organizations; Role of Communication in Business Organizations; Importance of Communication in Management of Business Organizations; Scope of Communication in Organizational Setting; Characteristics of Effective Business

	Communication; New Communication Environment; Ethical challenges and Traps in Business Communication; Role of Communication in Three Managerial Roles Defined by Henry Mintzberg.
9	<b>Formal Conversations: Meetings, Interviews and Group Discussions:</b> Meetings; Duties of Participants; Interviews; Group Discussions.
10	<b>Greetings and Introduction:</b> Basics of greetings and introduction; formal and informal introduction; Reading comprehension, Vocabulary; Pronunciation: Falling and rising tone; Speaking: Body language; Listening: body language.
11	<b>Listening Skills:</b> Importance of Listening; Listening versus the Sense of Hearing; Listening as Behaviour; Payoffs for Effective Listening; Actions Required for an Effective Listener; Approaches to Listening; Misconceptions and Barriers that Impair Listening; Planning for Effective Listening; How to be a Good Listener?; What Speakers can do to Ensure Better Listening?.
12	<b>Formal and Informal Letters:</b> Distinction between Formal and Informal Letters; Writing Formal Letters; Informal Letters.
13	<b>Communication on the Net:</b> E-Mail; Netiquettes; Blog Writing; Web Writing.
14	<b>Report Writing: Business Reports:</b> Significance; Types of Reports; Five Ws and one H; Report Planning; Report Writing Process; Outline of a Report; Guidelines for Writing Report; Technicalities of Report Writing; Visual Aids in Reports; Criteria used for Judging the Effectiveness of a Report; Illustrations.
15	<b>Job Applications and Resume Writing:</b> Job Application/Covering Letter; Resume/CV Writing.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Harvard Business School Press (2003), Business Communication: Harvard Business Essentials, Boston, Massachusetts.
- B. Krizan, A.C. Buddy, Merrier, Patricia, Logan, Joyce and Williams, Karen (2008), Business Communication, Thomson South-Western.
- C. Guffey, m Mary E. (2000), Business Communication: Process and Product, South-Western College Publishing.;

**WEB LINKS:**

- A. <http://www.commissionedwriting.com/GRAMMAR%20ESSENTIALS.pdf>.
- B. [http://www.esf.edu/fnrm/documents/FNRM\\_Communications\\_Handbook2008.pdf](http://www.esf.edu/fnrm/documents/FNRM_Communications_Handbook2008.pdf).
- C. <Http://books.google.co.in/books?id=RETE15K43qsC&printsec=frontcover&dq=essentials+of+english+grammer+pdf&hl=en&sa=X&ei=XlpSU6PEKY2HrgfyqoDoAQ&ved=0CDIQ6AEwAQ#v=onepage&q&f=false>.

YEAR II

**HUMAN ANATOMY AND PHYSIOLOGY-II – ANT14202**

UNIT	CONTENT
<b>SECTION A (HUMAN ANATOMY-II)</b>	
1.	<b>The Urinary System:</b> Gross anatomy of the Human Urinary System - Kidney, Ureter, Urinary Bladder, Male and Female Urethra; Histology of organs of urinary system - Kidney, Ureter, Urinary Bladder, Male Urethra (Penile Urethra) & Female Urethra.
2.	<b>The Reproductive System:</b> Definition and general consideration; Parts of male reproductive system - Testis, accessory organs; Parts of female reproductive system - Ovary, Mammary Gland and accessory organs; Histology of –Testis, Prostate, Ovary, Uterus, Fallopian Tubes, Umbilical cord and Placenta.
3.	<b>The Nervous System:</b> Neuron; Classification of Nervous System; Central nervous system – Cerebrum, basal nuclei, Cerebellum, Brainstem, Spinal Cord; Peripheral nervous system - Cranial nerves, Spinal nerves, Segmental innervations of skin; Meninges; Ventricles and Cerebrospinal fluid; Blood supply of the brain; Histology of - Cerebrum, cerebellum, spinal cord, peripheral nerve and ganglia.
4.	<b>The Endocrine System:</b> General consideration of endocrine system; Anatomy of glands and endocrine system – Anatomy of Pituitary Gland, Thyroid Gland, Parathyroid Gland, Suprarenal Gland and Pineal Gland; Histology of Endocrine Glands - Pituitary gland, Thyroid gland, Parathyroid & Suprarenal Glands.
5.	<b>The Sensory Organs:</b> Anatomy of eye – Extraocular structures, Intraocular structures, visual pathways, microscopic anatomy (histology) of retina, microscopic anatomy (histology) of cornea; Anatomy of ear – external ear, inner ear (labyrinthine).
6.	<b>General Embryology:</b> Ovum & Sperm – sperm, ovum; Fertilization – acrosome reaction, only one sperm fertilizes the egg; Embryogenesis - Cleavage of zygote and formation of blastocyst, Implantation, Bilaminar Germ Disc, Gastrulation, Neurulation, Development of somites, Organogenesis, Folding of embryo, Germ layer derivatives, Placenta, Parturition, Amnion & amniotic fluid, Yolk sac, and Allantois; Multiple pregnancies.
7.	<b>Surface Anatomy &amp; Radiology:</b> Techniques for examining body – Inspection, Palpation, Percussion and Auscultation; Surface Marking – Joints (Shoulder, elbow, wrist, knee), Organs (Heart, Lungs, Pleura, Liver, Spleen, Stomach and caecum), Glands (Parotid, Pituitary fossa and gland, sub-mandibular salivary gland), Surface markings and Arteries Aorta (Carotid, Brachial, Radial and Dorsalis Pedis artery), Surface marking of Veins (Jugular, Median Cubital, Cephalic), Surface marking Nerves (Median, Ulnar, Lateral popliteal and Sciatic); Radiological Anatomy and Basic Concepts - Radio-opacity, Positioning, Properties of x-rays, Basic radiographic procedure, and Other imaging techniques; Radiological anatomy of different regions of the body – chest, abdomen, joints of upper and lower limbs.
8.	<b>Anatomical Techniques:</b> Embalming of human cadaver – Purpose of embalming, modern embalming, embalming chemicals, specialist embalming, and hazards of embalming; Museum Techniques – collection of material, fixation, storage of specimens before mounting, mounting of jars, mounting of solid-perspex, labeling of museum jars, methods of presentation; Basic principles of Karyotyping – Purpose, preparing karyotypes from mitotic cells, banding patterns reveal the structural details of chromosomes, and organizing chromosomes in karyograms for review.
<b>SECTION B (PHYSIOLOGY-II)</b>	
9.	<b>Excretory System &amp; Body Fluid Homeostasis:</b> Functional anatomy of kidney –Nephron, Juxtaglomerular apparatus, renal regulation; Glomerular filtration - filtration barrier, forces governing filtration; Tubular functions – Mechanism of tubular reabsorption, Mechanism of tubular secretion, Renal function test; Excretory functions of skin; Homeostatic imbalances – Glomerular disease.



10.	<b>Endocrine &amp; Reproductive System: General considerations:</b> Endocrine glands and hormones – Pituitary gland, thyroid glands, parathyroid gland, adrenal gland, thymus, pancreas; Homeostatic imbalances – Pituitary disorders, Thyroid gland disorders, Parathyroid gland disorders, Adrenal gland disorders, Pancreatic disorders; General consideration of Reproduction - Male Sex Hormones, Female Sex Hormones, Menstrual cycle, Ovulation, Function of Placenta.
11.	<b>Nervous System:</b> Functional anatomy of the nervous system – Central nervous system, peripheral nervous system, neuron and nerve, synapse; The sensory system - Cerebral cortex, sensory tracts; The motor system - Cerebral motor cortex, the descending tracts in the spinal cord; Structures associated with motor activity - Cerebellum, Basal ganglia, Thalamus, Red nucleus, Reticular formation, Muscle tone, Posture and equilibrium, ANS, Hypothalamus, Neural function, Cerebral hemispheres, electrical activities of the cerebral cortex; Clinical connection - Hydrocephalus; Homeostatic imbalances – Epilepsy, Spinal cord compression, Parkinson’s disease.
12.	<b>Special Senses:</b> Olfaction the sense of smell; Gustation the sense of taste; Vision - Functional anatomy of the eye ball, neurophysiology of vision; Hearing - Organ of corti, transmission of sound, mechanism of hearing; Clinical connection - Hyposmia, Taste Aversion, Detached Retina, Presbyopia.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. William Arnould, A Textbook of anatomy and physiology, Taylor, 1998.
- B. Adeyemi Olubummo, Human Anatomy and Physiology: Study Notes, 2010.
- C. Paul D. Anderson, Human Anatomy & Physiology Coloring Workbook, 2009.

**WEB LINKS:**

- A. [http://www.phschool.com/atschool/florida/pdfbooks/sci\\_Marieb/pdf/Marieb\\_ch25.pdf](http://www.phschool.com/atschool/florida/pdfbooks/sci_Marieb/pdf/Marieb_ch25.pdf).
- B. [http://books.google.co.in/books?id=jVHkyWzY-\\_4C&printsec=fronthcover&dq=human+anatomy+and+physiology&hl=en&SA=X&ei=z5PxU5i3L4XvoAS4-YKIAg&sqi=2&ved=0CEsQ\\_6AEwCA#v=onepage & q=human%20anatomy%20and%20physiology&f=false](http://books.google.co.in/books?id=jVHkyWzY-_4C&printsec=fronthcover&dq=human+anatomy+and+physiology&hl=en&SA=X&ei=z5PxU5i3L4XvoAS4-YKIAg&sqi=2&ved=0CEsQ_6AEwCA#v=onepage & q=human%20anatomy%20and%20physiology&f=false).
- C. <http://www.pathologyoutlines.com/topic/>

**HUMAN ANATOMY AND PHYSIOLOGY-II (P) – ANT14202P**

1. Histology
  - a) Histology of Kidney
  - b) Histology of Ureter
  - c) Histology of Urinary Bladder
  - d) Histology of Testis
  - e) Histology of Prostate
  - f) Histology of Ovary
  - g) Histology of Uterus
  - h) Histology of Fallopian tube

- i) Histology of Umbilical cord
- j) Histology of Cerebrum
- k) Histology of Cerebellum
- l) Histology of Spinal cord
- m) Histology of Thyroid gland
- n) Histology of Cornea
- o) Histology of Retina

2. Specimen

- a) Kidney
- b) Testis
- c) Uterus
- d) Brain
- e) Cross section of Spinal cord
- f) Eye

3. Radiological Anatomy

- a) Chest X-ray
- b) KUB
- c) X-ray of Shoulder joint
- d) X-ray of Elbow joint
- e) X-ray of Wrist joint
- f) X-ray of Hip joint
- g) X-ray of Knee joint
- h) X-ray of Ankle joint

4. Perimetry (Charting the Field of Vision).

5. Examination of Visual Acuity.

6. Examination of Color Vision.

7. Tuning-Fork Tests of Hearing.

8. Determination of sensation of Taste.

9. Determination of sensation of Smell.

10. EEG.

11. Electroneurodiagnostic Tests.

**BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY –**  
**MBL14215**

UNIT	CONTENT
1.	<b>Systemic Bacteriology:</b> Introduction to bacteriology; Study of different organism - Staphylococcus, Streptococcus pneumoniae, Neisseria gonorrhoea, Neisseria meningitidis, Corynebacterium diphtheriae, Mycobacterium, Clostridium, Spirochaetes; Resistance & virulence factors of staphylococcus aureus - cell wall structure associated, extracellular factors, extracellular enzymes, methicillin resistance in staphylococcus aureus; Food poisoning and staphylococcal diseases – Staphylococcal food poisoning and staphylococcal diseases; Toxic shock syndrome caused by Staphylococcus aureus.
2.	<b>Enterobacteriaceae and V. Cholera:</b> Enterobacteriaceae - Isolation and Identification of Enterobacteriaceae, classification of Enterobacteriaceae; Escherichia coli – morphology and culture, biochemical reaction, antigenic structure, toxins, pathogenesis and types of Escherichia coli; Cultural characteristics and morphology, pathogenesis, and laboratory diagnosis of Klebsiella, Proteus, Salmonella, Citrobacter, and Vibrio cholera.
3.	<b>Immune System:</b> Host defence against infection – infectious agents, host defence, and immune recognition; Structure and function of immune system – organs of immune system, cells of immune system, function of immune system; Immunity and Immune Response – cellular basis of immunity, molecular basis of immunity, immune response and disease; Types of immune system – Innate immunity, adaptive immunity, and passive immunity; Production and function of B cells during bacterial infections – Production of B cells, activation of B cells; Production and function of T cells during bacterial infections – types of cells, production of T cells, activation of T cells; Immune based therapies – vaccines, monoclonal and therapeutic antibodies.
4.	<b>Complement System:</b> General properties of complement; Types of complement; Activation and regulation of complement pathways – Pathways of complement activation; Biosynthesis of complement; Biological effects of complement; Deficiencies of the complement system – Deficiencies in the classical pathways, Deficiencies in lectin pathways component, and Deficiencies of the alternative pathways; The effects of microbial infection on complement.
5.	<b>Immunology and Serology:</b> Introduction to immunology; Antigens – Properties and types of antigens, types of antigens; Biological classes of antigens; Various determinants of antigenicity; Structure and function of immunoglobulins/antibodies – general functions of immunoglobulins, structure of immunoglobulins and different types of immunoglobulins; Brief aspects of abnormal immunoglobulins; Serology; Common serological tests – ELISA, WIDAL, VDRL, ASLO, CRP, RF, HIV (Rapid test), HBsAG (Rapid test); General features of antigen-antibody reactions – precipitation reactions, agglutinations, complements fixation test, neutralization, opsonization, radioimmunoassay (RIA) test, and immunofluorescence (IF) test.
6.	<b>Parasitology:</b> Introduction to parasitology - description of parasitology and different fields of parasitology; Definition of parasitism, host, vectors; Classes of parasites – Protozoa, Helminths, and arthropods; Classes of host; Classification of Protozoa - Non-pathogenic protozoa, pathogenic protozoa; Host parasite relationship; Classification of Helminthes – cestode, trematode, nematode; Laboratory diagnosis of parasitic infections – direct and indirect identification of parasites.
7.	<b>Protozoa:</b> Morphology, lifecycle, pathogenicity, clinical features, lab diagnosis, prophylaxis & treatment of Entamoeba histolytica, Entamoeba coli, Giardia lamblia, Trichomonas vaginalis, Plasmodium vivax, and Plasmodium falciparum; Difference between P. vivax, P. malariae, P. falciparum and P. ovale.
8.	<b>Nematodes:</b> Morphology, lifecycle, pathogenicity, clinical features & lab diagnosis of Ascaris lumbricoides, Trichinella spiralis, Trichuris trichiura, Enterobius vermicularis, Ancylostoma duodenal, Wucheria bancrofti, LoaLoa, Onchocerca volvulus, and Dracunculus medinensis.

9.	<b>Helminthes:</b> Difference between Platyhelminthes and Nematelminthes; Morphology, lifecycle, pathogenicity, clinical feature & lab diagnosis of Taenia solium, Taenia saginata, Echinococcus granulosus, Fasciolopsis hepatica, Schistosoma haematobium.
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**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Barbara H. Estridge, Anna P. Reynolds, Basic Clinical Laboratory Techniques, Cengage Learning; 6<sup>th</sup> edition.
- B. Kawai T, Akira S (February 2006), “Innate immune recognition of viral infection” Nature Immunology.
- C. Plotkin SA (April 2005). “Vaccines: past, present and future”, Nature Medicine.

**WEB LINKS:**

- A. [http://textbookofbacteriology.net/staph\\_2.html](http://textbookofbacteriology.net/staph_2.html).
- B. <http://www.austincc.edu/microbio/2993t/tss.htm>.
- C. <http://www.livescience.com/26579-immune-system.html>.

**BACTERIOLOGY, IMMUNOLOGY AND PARASITOLOGY (P) – MBL14215P**

1. Staining.
2. Hanging Drop Method for Motility.
3. Bacterial and Fungal culture by Conjunctival Scrapping.
4. Techniques for Isolation of Pure Cultures.
5. Preparation of Bacterial Smears.
6. Antibiotic Sensitivity Testing- Kirby-Bauer Method.
7. Rapid Detection of Hepatitis B Surface Antigen (HbsAg).
8. Qualitative Determination of HIV 1/2 Antibody.
9. Widal Test.
10. VDRL Test.
11. Determination of CRP.
12. RA Test.
13. ASO Test.
14. ELISA Test.

**CLINICAL BIOCHEMISTRY – BCH14212**

UNIT	CONTENT
1.	<b>Overview of Clinical Biochemistry:</b> Introduction & importance to clinical biochemistry; Review of clinical aspects of carbohydrates; Lipids; Proteins and Amino Acids metabolism; Enzymes; Integration of Metabolism; Genetic Metabolism.

2.	<b>The Clinical Chemistry Laboratory and Organ Systems:</b> The Role of clinical biochemistry in medicine; Interpretation of the laboratory data of - Cardiovascular Circulatory system, Respiratory tract, Liver, Renal system, Digestive system, Endocrine system, Bone, Central nervous system.
3.	<b>Hemoglobin Production Disorders and Testing:</b> Heme synthesis; Absorption; Transport and Storage of iron; Assessing iron levels and forms; Iron deficiency; Practice calculation: cubic and percentage saturation of iron; Interpretation of Iron Results.
4.	<b>Metabolic Bone Diseases:</b> Normal physiology and Metabolism of bone, calcium, phosphate and magnesium; Clinical disorders of calcium, phosphorus, magnesium metabolism, their etiology, pathophysiology, metabolic abnormalities, complication and management; Metabolic disorders of bone, biochemical markers of bone turnover, biochemical profile in various clinical disorders of bone.
5.	<b>Assessment of Cardiovascular Disorders:</b> Acute myocardial infarction; (Cardiac markers); The role of HDL; Physiological changes in lipid and lipoprotein levels; Diabetes and Cardiac disease; National cholesterol education program; C-reactive protein; Primary and Secondary Hyperlipoproteinemia; Apoproteins; Hypoalphalipoproteinemia; Hyperbetalipoproteinemia; Abnormalities with apoprotein E; Abetalipoproteinemia.
6.	<b>Assessment of Respiratory Disorders:</b> Collection and handling of arterial blood gases; Assessment for arterial blood gases; Calculations in arterial blood gas analysis; Arterial collection; Venous versus arterial samples; Acid-base status; Metabolic acid-base disturbances; Respiratory acid-base disturbances; Approach to interpreting acid-base disturbance; Oxygenation status; Oxygen-carrying capacity and content; Chronic bronchitis; Fetal lung maturity; Respiratory distress syndrome; Analysis of oxygenation; Toxic gases; Cyanide poisoning; Carbon monoxide poisoning; Distribution of gases via circulation of erythrocytes; Pathological effects of carbon monoxide; Analysis of carboxyhemoglobin.
7.	<b>Assessment of Nutrition and Digestive Function:</b> Nutrition - Nitrogenous biomarkers of nutritional status, Vitamins, Trace elements; Nutritional disorders - Vitamin A metabolism, Vitamin A night blindness, Vitamin-related macrocytic anemia; physiological and nutritional changes with age; Pre-diabetes and metabolic syndrome; Testing strategies for macrocytic anemia.
8.	<b>Digestive and Endocrine Disorders:</b> The gastrointestinal tract; Malabsorption; Gastric fluid analysis; Zollinger-ellison syndrome; Cystic fibrosis; Gastric fluids and electrolyte levels; Other electrolyte disturbances resulting from gastrointestinal disturbances, Intestinal loss, Bulimia nervosa; Classification of hormones; Hormone receptors; Feedback control; The pituitary gland; The adrenal glands; Cortisol synthesis; Cortisol activity; Diseases of the adrenal cortex.
9.	<b>Therapeutic Drug Monitoring and Toxicology:</b> Therapeutic drug monitoring; Drug metabolism; Drug action of antibiotics; Drug action of cardioactive agents; Toxicity of cardioactive drugs; Methods of analysis for therapeutic drugs; Immunosuppressive Drugs.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Henry, John Bernard. Clinical Diagnosis and Management by Laboratory Methods (20<sup>th</sup> Ed.) Philadelphia: Saunders 2001.
- B. Rose S. and Mileusnic, R. The Chemistry of Life. Penguin Press Science, 1999.
- C. Lane, N., Oxygen: The Molecule that Made the World. Oxford University Press. USA, 2004.

**WEB LINKS:**

- A. [http://www.nlm.nih.gov/cgi/mesh/2011/MB\\_cgi?mode=&term=Carbohydrate+Metabolism&field=entry](http://www.nlm.nih.gov/cgi/mesh/2011/MB_cgi?mode=&term=Carbohydrate+Metabolism&field=entry).

- B. [http://www.si.mahidol.ac.th/department/Biochemistry/home/sibc511/integration\\_of\\_metabolism\\_web.pdf](http://www.si.mahidol.ac.th/department/Biochemistry/home/sibc511/integration_of_metabolism_web.pdf).
- C. <http://www.merckmanuals.com>

### **CLINICAL BIOCHEMISTRY (P) – BCH14212P**

1. Determination of blood glucose.
2. Glucose tolerance test.
3. Qualitative Identification of Ketone Bodies in Urine.
4. Determination of total Protein in blood.
5. Determination of Albumin in blood.
6. Estimation of Urea in urine.
7. Determination of Urea.
8. Estimation of Creatinine in urine.
9. Estimation of Creatinine in blood.
10. Determination of Uric Acid.
11. Estimation of sodium, potassium & chloride.
12. Qualitative Detection of Bile Pigments by Fouchet's Method.
13. Qualitative Detection of Bile Salts by Hay's Test.
14. Determination of bilirubin.
15. Determination of SGOT.
16. Determination of SGPT.
17. Determination of Alkaline phosphatase.
18. Determination of Cholesterol.
19. Determination of serum Triglycerides.
20. Determination of LDL.
21. Determination of HDL.
22. Estimation of LDH Enzyme.
23. Estimation of Serum CPK.
24. Estimation of serum Amylase.
25. Estimation of Acid phosphatase.
26. Estimation of serum Calcium.
27. Estimation of serum phosphorus.
28. Collection of Blood for ABG.
29. Estimation of Vitamin A.

## HEMATOLOGY AND BLOOD BANKING – BBN14201

UNIT	CONTENT
1.	<b>Hematology:</b> Hematology – Composition of blood, formation of blood and functions of blood; Collection of blood - Different routes of blood collection, difference between capillary and venous sample; Anticoagulants - Different types of anticoagulants, method of preparation and uses of anticoagulants.
2.	<b>Haemoglobin:</b> Colorimetric Method; Chemical Method; Specific Gravity Method; Gasometric Method; Clinical importance.
3.	<b>Red Blood Cells:</b> Red Blood Cells - Red Blood Cells (RBC) Total Count, Normal and abnormal values, and Physiological variations; Haemocytometer; Anemia – Classification of Anemia; Sickle cell anemia: slide Preparation - Haematocrit, Red cell indices: normal and abnormal values; Erythrocyte Sedimentation Rate - Westergrens & Wintrobe’s Method, Factors affecting values; Limitations and Significance.
4.	<b>White Blood Cells:</b> White Blood Cells - Differential Count, Normal and abnormal values and physiological variation; Preparation of peripheral blood smear; Staining by different methods - Methods of examinations and reporting, White Blood Cell Count, Normal and abnormal values, Haemocytometer.
5.	<b>Reticulocytes:</b> Methods of Reticulocytes; Normal values and Significance; Osmotic Fragility test.
6.	<b>Haemostasis and Coagulation Mechanism:</b> Coagulation Factors – The coagulation mechanism; Coagulation Tests – Tests evaluation primary hemostasis and Tests evaluation secondary hemostasis; LE cell - Demonstrating LE cells; Parasitic infections in Blood and their demonstration – Malaria plasmodium, Leishmania and LD bodies, and Microfilaria.
7.	<b>Bone Marrow:</b> Peripheral blood smear - Thin smear, thick smear, Buffy coat smear, and wet smear; Bone Marrow smear; Romanowsky staining - Principle and methods of staining Blood smears and bone marrow smears; Supravital staining - Reticulocyte count, and Heinz bodies; Application of Radioisotopes in haematology.
8.	<b>Blood Banking:</b> Immunohematology - Blood group antigen and their inheritance; ABO blood group system – Antigens and antibodies: blood typing; Rh blood group system - Nomenclature, The rhesus antigens, Rh antibodies, and Rh inheritance; Other blood group systems – MNS blood group, Kell blood group, and Bombay Blood group; Preparation and Preservation of antisera; Blood grouping and cross matching; Coomb’s test - Titration of antibodies; Transfusion - Selection of the donor, Screening test for donor, Preparation and properties of anticoagulant solution, and Apparatus for blood transfusion.
9.	<b>Investigation of Transfusion Reaction:</b> Hemolytic disease of the newborn (HDN); Exchange transfusion; Transfusion transmitted diseases – viral diseases, bacterial diseases, and protozoal diseases; Cell preparation and transfusion of various components of blood; Serum immunoglobulin; Administration and operation of blood bank.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Briggs C. Quality Counts: New parameters in blood cell counting. International Journal of Laboratory Hematology 2009; 31:277-297.
- B. Taylor M.R.H., Holland C.V., Spencer R., et al: Haematological reference ranges for school children. Clin Lab Haematol 1997; 19:1-15.
- C. Wenk RE. Comparison of five methods for preparing blood smears. Am J Med Technol. 1976; 42: 71-78.

## WEB LINKS:

- A. <http://www.cliffsnotes.com/cliffnotes/sciences/what-is-the-composition-and-volume-of-whole-blood>.
- B. [http://sydney.edu.au/science/biology/learning/blood\\_composition/Plasma.html](http://sydney.edu.au/science/biology/learning/blood_composition/Plasma.html).
- C. <http://www.healthline.com/health/white-blood-cell-count-and-differential#Procedure3>.

## **HEMATOLOGY AND BLOOD BANKING (P) – BBN14201P**

1. Paraffin section cutting.
2. Staining by Hematoxylin & Eosin and other special stains.
3. Determination of Hemoglobin and Hematocrit.
4. Red blood cell count.
5. Total white blood cell count.
6. Platelet count.
7. Differential count of white blood cells.
8. Absolute Eosinophil count.
9. Reticulocyte count.
10. Calculation of red cell indices.
11. Determination of ESR.
12. Determination of BT, CT, Whole blood clotting time.
13. Determination of PT and PTT.
14. Blood smear preparation and staining.
15. Osmotic fragility test.
16. Sickling test.
17. LE cell preparation.

## **COMMUNITY MEDICINE – MED14201**

UNIT	CONTENT
1.	<b>Natural History of Disease:</b> Determinants of health, multi – factorial causation of disease host, agent, and environment relationship primary, secondary and tertiary levels of prevention with examples related to few diseases of national importance.
2.	<b>Mode of Transmission of Disease:</b> Air – borne, vector and vehicle transmission; Methods of control with examples for control of each mode.
3.	<b>Disinfection:</b> Disinfection of the infective materials received in the Laboratory by using the appropriate disinfection methods, at the health centre level.
4.	<b>Health Services:</b> Brief description of organization of health services at the centre and state levels; Primary Health Care - Definition, components and principles of primary health care; Health for all indicators; Primary Health Centre - The functions, staffing pattern and the role of laboratory technicians in primary Health Centre.
5.	<b>National Programmes of Health and Disease Eradication /Control:</b> Health Programmes



	- Family Welfare Programme, National Programme for water supply and sanitation, Nutritional Programmes, Immunization and universal immunization programme; Disease Eradication programme - Leprosy & Guinea worm; Disease control programmes - Tuberculosis, Malaria, Filariasis, S.T.D, Goitre, Cholera and other diarrhoeal diseases and National Programme for prevention of blindness including trachoma.
6.	<b>Demography &amp; Population Control:</b> The factors influencing population growth, death rate, birth rate and methods of contraception.
7.	<b>Biostatistics:</b> Application of statistical principles in history; Presentation of data, calculation of mean, median and mode, range and standard deviation and their significance; Significance of 'T' test, Chi square values.
8.	<b>Environmental Sanitation:</b> Methods of water purification and disinfection, collection of water samples, their transport and bacteriological analysis; Methods of excreta disposal.
9.	<b>Health Education:</b> Definition, principles, objectives, purpose, types and AV aids; Communication - definition, process and types, Behavioral change communication; IEC (Information education and communication) - aims, scope, concept and approaches; Inter personal relationship - Co-ordination and co-operation in health education with other members of the health team; Teaching and learning process, concept, characteristics of learner and educator; Role and skill of health professional in Health Education.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Wise Geek. "What is the difference between communicable and non-communicable disease? Conjecture Corporation 2008.
- B. Duffy, FD. Gordon, GH., Whelan, G., Cole-Kelly, K., & Frankel R. Assessing competence in communication and interpersonal skills: The Kalamazoo II report. Academic Medicine, 79, 495 – 507.
- C. "Health Centres the Next Step". Socialist Health Centres. 1975 Retrieved 18 October 2014.

**WEB LINKS:**

- A. <http://www.diseaseprevention.com/>
- B. <http://preventdisease.com/prevention/prevention.html>.
- C. <http://www.healthline.com/health/disease-transmission#IndirectContact3>

**BASIC AND CLINICAL PHARMACOLOGY – PHM14202**

UNIT	CONTENT
1.	<b>General Pharmacology:</b> Pharmacology; Different branches of Pharmacology; Routes of drug administration; Absorption, Distribution, Metabolism and excretion of drugs; General mechanism of drug action; Animal used in experiments; Animal handling and ethics; Bioassay procedures; Instruments used in Pharmacology; Basics of Clinical trials.
2.	<b>Drugs Acting on CNS:</b> General anesthetics; Anxiolytic and hypnotic drugs; Psychotropic agents; Epilepsy and Anticonvulsant drugs; Narcotic analgesics and antagonists; Centrally acting muscle relaxation and antiparkinsonism agents; Analgesics; antipyretics; anti-inflammatory agents and Central nervous system stimulant; Local anesthetics.
3.	<b>Drugs Acting on ANS:</b> Autonomic nervous system and neurohumoral transmission; Cholinergic or parasympathetic drugs; Anticholinergic or parasympathomimetic drugs;

	Adrenergic or sympathomimetic drugs; Sympatholytic drugs; Drugs acting on autonomic ganglion; Neuromuscular blockers.
4.	<b>Drugs Acting on Respiratory System:</b> Bronchodilators; analeptics; Nasal decongestants, expectorants; antitussive agents.
5.	<b>Drugs acting on Cardiovascular System:</b> Antiarrhythmic drugs; Cardiotonics; Antianginal drugs; Antihypertensive drugs; Drugs used in atherosclerosis.
6.	<b>Drugs Acting on Blood and Blood Forming Organs:</b> Haematinics – Iron (Fe); Coagulants; Anticoagulants; Blood and plasma expanders.
7.	<b>Hormones and Hormone Antagonists:</b> Antithyroid drugs; Hypoglycaemic agents; Sex hormones and oral contraceptives; Corticosteroids.
8.	<b>Opioid Analgesics:</b> Endogenous opioid peptides; Opioid receptors; Effects of clinically used opioids; Morphine and related opioid agonists; Acute opioid toxicity; Opioid agonist & antagonist; Therapeutic uses of opioid analgesics.
9.	<b>Drug Addiction and Drug Abuse:</b> Drug dependence; Physical dependence on Drugs; Clinical issues.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Basic and Clinical Pharmacology, Bertram G. Katzung, McGraw-Hill Medical, 2007.
- B. Pharmacology, 2/e, Bhattacharya, Elsevier, 2<sup>nd</sup> edition – 2003.
- C. Desk Reference of Clinical Pharmacology, Second Edition, Manuchair Ebadi, 2007.

**WEB LINKS:**

- A. <http://4my1616.blogspot.in/>
- B. <http://howmed.net/pharmacology/mechanism-of-drug-action-an-introduction>.
- C. <http://www.ppd.com/About/CRO-Overview/Clinical-Research-Basics.aspx>

**HISTOTECHNOLOGY – PAT14301**

UNIT	CONTENT
1.	<b>Introduction to Histopathology:</b> Histology - Automated histology equipment, Sections of histology, Histological techniques, Fixation, Embedding, Staining, Tissue preparation.
2.	<b>Microtomes:</b> Introduction; Types of Microtome - Sliding or Base Sledge Microtome, Rocking Microtome, Rotary Microtome, Freezing Microtome; Principle of working of microtome, Maintenance of Microtome; Parts and types of Microtome knife; Sharpening and maintaining Microtome Knives - Honing, Stropping.
3.	<b>Section Cutting:</b> Techniques of section cutting - Requirements, Methods of section cutting; Faults occurring during section cutting and their remedies.
4.	<b>Routine Staining Procedures:</b> Introduction; Types of forces responsible for attachment of tissue and stain; Dye Chemistry; Routine staining procedure of tissue in Histotechnology- Steps in routine staining.
5.	<b>Basic and Acid Dyes:</b> Terms related to dyes- Mordant, Amphophilic, Neutrophilic, Metachromatic; Methods of staining - Acid phosphatase, Alkaline phosphatase, Azocarmine, Berlin blue, Bielschowsky's silver method, Bodian silver method, Cajal's silver stain, Chrome Hematoxylin and phloxin, Hematoxylin & Eosin, Wright's blood stain.
6.	<b>Controls in Various Staining Procedures:</b> Staining procedures and controls - Van Gieson's stain for collagen fibers, Alkaline Congo Red stain for amyloids, Periodic Acid Schiff's stain (PAS) for carbohydrates, Masson's Trichrome stain for collagens.
7.	<b>Collection and Processing of Cytological Specimen:</b> Introduction; Collection - Fine Needle Aspiration Cytology (FNAC); Processing - Preservation, Fixation, Preparation of Smear for microscopic study.
8.	<b>Histopathology Laboratory Organization:</b> Quality Control in Histopathology Laboratory (pre-analytical phase, analytical phase, post analytical phase), Quality Control to Total Quality Management.
9.	<b>Laboratory Mathematics and Solution Preparation:</b> Percentage solutions; Use of the Gravimetric factor in solution preparation; Hydrates; Normal and Molar solutions; The Metric system; Temperature conversion; Buffers; General guidelines for Solution preparation, Use and Storage; Stability of solutions.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Carson F, Hladik C. (2009), Histotechnology: A Self-instructional Text, 3<sup>rd</sup> Ed.
- B. Kiernan J. Histological and Histochemical Methods: Theory and Practice, (2008), 4<sup>th</sup> ed.
- C. Bancroft JD, Gamble M. Theory and Practice of Histological Techniques, (2007), 6<sup>th</sup> Ed.

**WEB LINKS:**

- A. <http://www.webmd.com/a-to-z-guides/fine-needle-aspiration?page=2>.
- B. <http://www.slideshare.net/biotechvictor1950/histological-techniques>.
- C. <http://www.pdn.ac.lk/dental/dental/about/Histology%20Techniques.pdf>.

**VIROLOGY, MYCOLOGY AND APPLIED MICROBIOLOGY –**  
**MBL14310**

UNIT	CONTENT
1.	<b>Medical Virology:</b> Virus host interaction; Virus - Morphology, Structure and Properties, Classification of DNA and RNA Virus, Viroids, Prions, Bacteriophage; Common viral diseases - HIV, Hepatitis virus, Pox virus, Poliovirus, Influenza virus, Mumps, Measles, Herpes virus, Rubella, Respiratory syncytial, Arbovirus prevalent in India, Cytomegalovirus, Prevention & treatment of viral infections.
2.	<b>Medical Mycology:</b> Meaning and definition of fungi - Classification of fungi, Zygomycetes, Basidiomycetes, Ascomycetes, Deuteromycetes, Morphology, characteristics and structure of fungi; Fungal diseases - Classification of fungal diseases, Laboratory diagnosis and treatment, Opportunistic mycoses, Candidiasis, Pneumocystis Pneumonia, Antifungal agents.
3.	<b>Serological Tests for Fungal Infections and Skin Tests:</b> Antigen and antibody tests - Agglutination, Immunodiffusion, Counter-Immuno-electrophoresis, Complement fixative test, Immunofluorescence, Radioimmunoassay (RIA) Test, ELISA; Skin tests in mycology - Histoplasmin Skin Test, Candida Skin Test, Limitation of Skin Test.
4.	<b>Diagnosis of Bacterial, Fungal and Viral Infections:</b> Direct Examination of Specimens - Direct Examination; Microscopy & Stains - Microbiological Staining, Identification in Histopathologic Material, Antigen detection, Molecular diagnostics.
5.	<b>Managing Microbiology Laboratory:</b> General concept on Managing microbiology - Laboratory organization, Laboratory Operations Manual, Recording of specimen and Laboratory Records, Recording of results; Care and maintenance of glassware - Recommended Glassware Cleaning and Handling Procedures, Heating Glassware, Maintenance of Laboratory Equipment; Quality control in microbiology - Ordering and Storage of Dehydrated Media, Stains and Reagents, Diagnostic Antigens and Antisera, Maintenance and Use of Stock Cultures, Preservation.
6.	<b>Technique Oriented Examination of Specimen:</b> Macroscopic and microscopic examination of the specimen - Pus, Urine, Stool, Sputum & throat swab; Wet and Dry Mount Techniques - Wet Mount Slide, Dry Mount Slide.
7.	<b>Epidemiology of Infectious Disease:</b> Introduction; Meaning and definition of Epidemiology - Definition of Infectious Diseases, Sources and Types of Infections; Types of Diseases - Epidemic, Endemic, Pandemic, Control and prevention of diseases.
8.	<b>Healthcare Associated Infections:</b> Healthcare Associated Infections - Types of healthcare associated infection; Nosocomial Infections (Hospital Infection) - Sources and types of nosocomial infections, Symptoms and Diagnosis, Prevention and Treatment.
9.	<b>Biomedical Waste Management:</b> Management of Biomedical Waste - Types of biomedical waste and their sources, Types of Hospital Risk Wastes, Hospital Non-Risk Waste, Risk from Waste, Techniques to Segregation of Waste; General principles of waste management - Important precautions.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Chernecky, Cynthia C., and Barbara J. Berger. Laboratory Tests and Diagnostic Procedures, 3<sup>rd</sup> ed. Philadelphia, PA: W.B. Saunders Company, 2001.
- B. Bauman, R. (2004) Microbiology. Pearson Benjamin Cummings.

**WEB LINKS:**

- A. <http://pathmicro.med.sc.edu/mayer/phage.htm>.
- B. <http://www.nlm.nih.gov/medlineplus>

## **VIROLOGY, MYCOLOGY AND APPLIED MICROBIOLOGY (P) – MBL14310P**

1. Complement Fixative Test (CFT).
2. Examination of Skin, Nail and Hair for Fungi.
3. Bacterial Culture of Urine.
4. Examination of Sputum Specimen.
5. Bacterial & Fungal Culture - Throat Swabs.
6. ELISA.
7. Qualitative Determination of HIV ½ Antibody.
8. Rapid Detection of Hepatitis B Surface Antigen (HBsAg).
9. RIA.
10. Bacterial and Fungal Culture (Other specimen).
11. Immunofluorescence Staining for Viruses.

## **ESSENTIALS OF MEDICAL PHARMACOLOGY – PHM14301**

UNIT	CONTENT
1.	<b>Drugs Acting on Gastro-Intestinal System:</b> Pharmacokinetics and Pharmacodynamics - Gastric Acid-Related Conditions, Peptic Ulcers, Agents used for Upper GI Tract Disorders, Nausea and Vomiting, Disorders of the Bowel, Gallstones, Prokinetic Agents, Digestive Enzyme Replacements; Side Effects - Common agents used in GERD/Hyperacidity, Common Agents used for Bowel Motility, Common Agents used for Constipation, Common Anti-Diarrhoeal Agents, Antinausea agents and Antiemetic Agents; Applications/Uses.
2.	<b>Antibiotics:</b> Antibiotics Inhibiting Protein Synthesis - Aminoglycosides, Tetracyclines, Chloramphenicol, Macrolide; Antibiotics affecting Membrane Permeable - Polymyxins, Gramicidin, Antibiotics that affect Bacterial cell structure.
3.	<b>Antituberculosis and Antileprotic Drugs:</b> Antituberculosis Drugs - Purpose, Recommended Dosage, Classification of Anti-tuberculosis Drugs, Pharmacokinetics and Pharmacodynamics, Precautions, Side Effects, Drug Interactions, Uses of Isoniazid; Introduction to Antileprotic Drugs - Dosage Administration, Pharmacokinetics and Pharmacodynamics, Contradiction, Side Effects, Uses of Antileprotic Drugs.
4.	<b>Antifungal Drugs:</b> Antifungal Drugs, Classes of Antifungal Drugs - Mechanism of Action, Pharmacokinetics and Pharmacodynamics, Side Effects, Medicinal Uses.
5.	<b>Antiviral Drugs:</b> Antiviral Drugs - Virus Life Cycle, Key Characteristics of Antiviral Drugs, Anti-viral Targeting, Antivirals for Treatment of Influenza in Children; Pharmacokinetics and Pharmacodynamics of Antiviral Drugs - Treatment of Respiratory Viral Infections, Treatment of Hepatic Viral Infections, Treatment of Herpes Virus Infections, Treatment for HIV Infection; Side Effects of Antiviral Drugs - Variation in Side Effects, Duration of side effects, Preparing to Start Treatment, Reporting Side Effects; Uses of Antiviral Drugs.
6.	<b>Antimalarial drugs:</b> Antimalarial Drugs - Life cycle of Malarial Parasite, Symptoms, Causes, Complications, Medication; Pharmacokinetics of Antimalarial Drugs, Drugs used to treat the acute attack, Drugs that affect a Radical Cure, Drugs used for Chemoprophylaxis, Drugs used to Prevent Transmission; Pharmacodynamics of Antimalarial Drugs; Side

	effects and uses of Antimalarial Drugs.
7.	<b>Antiamoebic, Antigiardial and Miscellaneous Antiprotozoal Drugs:</b> Antimicrobial Drugs - Introduction to Antiamoebic Drugs, Chemical Classification, Therapeutic Classification, Pharmacokinetics, Pharmacodynamics, Side Effects and Uses; Introduction of Antigiardial Drugs - Mode of Action and Drug Targets, Pharmacokinetics and Pharmacodynamics, Side Effects, Uses; Miscellaneous Antiprotozoal Drugs - Classes of Oral Antiprotozoal Drugs, Overview of Miscellaneous Antiprotozoal Drugs.
8.	<b>Antineoplastic Drugs:</b> Antineoplastic Drugs - Principles of Antineoplastic Chemotherapy, Resistance to Antineoplastic Agents, Patterns of Toxicity, Biologic Response Modifiers in Cancer Therapy, Safe Handling of Antineoplastic Agents, Classification of Antineoplastic Chemotherapeutic Agents; Pharmacokinetics and Pharmacodynamics of Antineoplastic Drugs - Antimetabolites, Camptothecins, Miscellaneous, Vinca Alkaloids, Podophyllotoxins, Taxanes, Alkylating Agents, Nitrosoureas, Antitumor antibiotics, Hormones and Hormones Antagonists; Side Effects of Antineoplastic Drugs - Blood Problems, Gastrointestinal Side Effects, Hair Loss, Fatigue, Nerve Problems, Sexual and Reproductive Side Effects, Skin and Nail Changes, Fluid Changes; Uses of Antineoplastic Drugs - Children, Adults, Older Adults.
9.	<b>Antiseptics, Disinfectants and Miscellaneous Antibacterial Drugs:</b> Antiseptics and Miscellaneous antibacterial Drugs - Mechanism of Action, Types of Antiseptics; Pharmacokinetics and Pharmacodynamics of Antiseptics - Disinfectants and Miscellaneous Antibacterial Drugs, Povidone-Iodine: Pharmacology, Chlorhexidine: Pharmacology; Side Effects and Uses of Antiseptics and Miscellaneous Antibacterial Drugs; Disinfectants; Instruments and Different Types of Disinfection; Side Effects and Uses of Disinfectants and Miscellaneous Antibacterial Drugs, their pharmacokinetics, pharmacodynamics, side effects and uses.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Gary C. Rosenfeld and David S. Loose, "BRS Pharmacology", 6<sup>th</sup> edition published by Wolters Kluwer.
- B. Brunton LL. The Pharmacological Basis of Therapeutics. 11<sup>th</sup> ed. New York: The McGraw-Hill Companies Inc; 2006.
- C. Taketomo CK, Hodding JH, Kraus DM. Pediatric Dosage Handbook. 16<sup>th</sup> ed. Lexi-Comp; 2009.

**WEB LINKS:**

- A. <http://dvm5.blogspot.in/2010/10/drugs-acting-on-digestive-systemlab-1.html>.
- B. <https://www.inkling.com/read/brs-pharmacology-rosenfeld-6th/chapter-8/ch08-reader-0>.
- C. <http://health.howstuffworks.com/medicine/medication/understanding-gastrointestinal-medications-ga.htm>.

**HISTOPATHOLOGY AND CYTOPATHOLOGY TECHNIQUES – PAT14302**

UNIT	CONTENT
1.	<b>Histopathology:</b> Definition and Overview of Histopathology - Branches of Histopathology; Sources and Types of Histological Specimens - Kinds of histological presentations; Method of Specimen Collection - Preparation for histology; Popular Fixative Solutions.

2.	<b>Histopathology Laboratory:</b> General organization of a Histopathology Laboratory- Basic Requirements for a Histopathology Laboratory; Role of Histopathology Laboratory in the Diagnosis of Diseases - Reception of Specimens, Identification and Recording in the Registers; Methods of Examination of Fresh Tissue Specimens - Teased preparations, Squash preparations, Smears, Frozen sections.
3.	<b>Processing:</b> Tissue Processing - Dehydration, Clearing, Infiltration; Embedding - Sectioning; Staining - Commonly used stains and their interpretation, artifacts.
4.	<b>Museum Technique:</b> General introduction - Organization of a museum, Source of materials, Reception, Preparation, Labeling; Fixation of various specimens and organs - Storage of specimen, Mounting of museum specimens, Advantages and disadvantages of Perplex and Glass Jar; Demonstration of Bone - Calculi, Transparent specimen (Fetal skeleton and amyloid), Modern methods in museum technique.
5.	<b>Enzyme Histochemistry and Its Diagnostic Applications:</b> Overview of Enzyme Histochemistry & Its Diagnostic Applications - Histochemical reactions, Types of Enzymes; Hydrolytic Enzymes - Demonstration of Alkaline Phosphatase, Demonstration of Acid Phosphatase; Demonstration of Specific Phosphates - Dehydrogenases; Enzyme Histochemistry and Diagnostic Applications, Application.
6.	<b>Lipids, Identification and Demonstration:</b> Overview of Lipids and their Functions - Oil Red O method for fats, Sudan Black B for Phospholipids in Paraffin sections and fats in frozen sections.
7.	<b>Microorganisms, Identification &amp; Demonstration:</b> Overview of Microorganism - Identification and Demonstration, Charles Churukian Microwave Ziehl-Neelsen method for Acid-fast bacteria, Gridley's method for Entamoeba histolytica; Modified Brown and Brenn method for Gram positive and negative bacteria.
8.	<b>Neuropathological Technique:</b> Staining of the components of Nervous tissue - Handling of neuropathological specimens; Processing brain and spinal cord tissue - Celloidin and Low Viscosity Nitrocellulose, Technique to stain axon in Peripheral Nervous System.
9.	<b>Advance Techniques in Histopathology:</b> Introduction; Cryostat and their uses - Principle, care and operation of cryostat, Automation in histopathology, Immunocytochemistry and its application; Immunofluorescence techniques in tissue sections - In situ hybridization, Electron microscopy processing and Techniques.
10.	<b>Cytology:</b> Definition and Overview of Cytology - History, Development and Scope of Cytology; Types of cytological specimen and collection - Preparation of slide for microscopic studies, Stains used in Cytology.
11.	<b>Analysis of Nucleic Acids &amp; Cytoplasmic Techniques:</b> Introduction, Microwave Ammoniacal Silver Method for Argentaffin & melanin - Microwave Schmorl's method for reducing substances, Churukian Schenk Argyrophil method, Microwave Giemsa method for Plastic bone marrow sections; Aldehyde Fuchsin method for Hepatitis B antigen - microwave Orcein method for Hepatitis B surface antigen, Toluidine Blue method for Mast cells, Long Ziehl-Neelson method for Ceroid; Methyl Green - Pyronin Y method for DNA and RNA - Aldehyde Fuchsin method for Pancreatic Beta cells, Wilson-Ezrin method for Pituitary, Feulgen staining procedure.
12.	<b>Fine Needle Aspiration Cytology:</b> Overview to Fine Needle Aspiration Cytology - Branches of Diagnostic cytology, FNAC & its clinical applications, Advantages & limitation of FNAC, Precautions & contradictions; Preparation for Biopsy equipment - Fixation & staining, Main aspects of safety in a cytology laboratory, Imaging method for Aspiration cytology.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Carson F, Hladik C. (2009): Histotechnology: A Self-instructional Text. (3<sup>rd</sup> Ed.)
- B. Kiernan J. (2008): Histological and Histochemical Methods: Theory and Practice (4<sup>th</sup> ed.).
- C. Luna, LG.: Histologic Staining Methods, 3<sup>rd</sup> ed.: New York: McGraw-Hill Book Co., C. 1968, p228.

**WEB LINKS:**

- A. <http://www.nationaldiagnostics.com/histology/article/decalcifying-tissue-histological-processing>.
- B. [http://histologylab.ccnmtl.columbia.edu/histological\\_techniques/](http://histologylab.ccnmtl.columbia.edu/histological_techniques/)
- C. [http://www.medicalcareers.nhs.uk/specialty\\_pages/pathology/histopathology.aspx](http://www.medicalcareers.nhs.uk/specialty_pages/pathology/histopathology.aspx).

**HISTOPATHOLOGY AND CYTOPATHOLOGY TECHNIQUES (P) –  
PAT14302P**

1. Rotary Microtome.
2. Tissue Processing.
3. Embedding.
4. Aldehyde Fuchsin Method for Pancreatic Beta Cells.
5. Modified Brown and Brenn Method for Gram Positive and Negative Bacteria.
6. Ziehl Neelsen Method for Acid Fast Bacteria.
7. Tissue Freezing Method for Cryostat Sectioning.
8. FNAC.
9. Pap Test.

**BIOMEDICAL TECHNIQUES, LAB MANAGEMENT AND ETHICS –  
MLT14301**

UNIT	CONTENT
1.	<b>Biomedical Techniques:</b> Methods of qualitative analysis of biomolecules; Principles, experimental procedures and application of chromatography – paper, thin - layer, ion exchange, affinity, gel filtration, gas-liquid and HPLC; Principles, procedures and application of Electrophoresis – paper, polyacrylamide gel, agarose gel, capillary and cellulose acetate.
2.	<b>Centrifugation Techniques:</b> Principle and technique of preparative and analytical Centrifugation, differential centrifugation, density gradient centrifugation, ultracentrifuge and its application.
3.	<b>Quantitative Methods:</b> Principles and applications of Photometry, Spectrophotometer, flame photometry, flow cytometry; ELISA, RIA Western Blotting, Immunoelectrophoresis.
4.	<b>Biomedical Instruments I:</b> Working principle and maintenance of common laboratory instruments-heating mantle, refrigerator, deep freezer, walk-in cooler, hot air oven, electronic balance, CRO, Multimeter, Calorimeter, Incubator, Laser application in medicine, maintenance of equipments-preventive maintenance and break down maintenance, calibration of equipments, Electrodes, pressure transducers.
5.	<b>Biomedical Instruments II:</b> EEG Recorder, EMG Machine, NCV and evoked potential recording, surgical diathermy, suction apparatus, Echo Encephalography, Ventilators, Nebulizer, humidifier, Spiro meter, multiparameter monitor; Normal ECG, ECG abnormalities, ECG recorder-single channel, multichannel, Tread mill ECG, ECG monitor, cardiac defibrillator, pacemaker, digital subtraction angiography; Oxymetry-transmission oximetry, reflection oximetry, fingertip Pulse oximeter, Eco cardiography, colour Doppler, Heart lung machine, infusion pump, blood gas analyzer.
6.	<b>Biomedical Instruments III:</b> Fiber optics, Endoscope, Sigmoidoscope, Audiometer – Pure tone, speech, Bekesey audiometers, Hearing aids, radioactivity, radiation detectors-



	ionization detector, GM counter, scintillation detector, photomultiplier tube, pulse height analyzer, collimator, gamma camera, cyclotron, CT scan, MRI, Positron Emission Tomography, SPECT, dialysis machine – peritoneal and haemodialysis, dialyzers.
7.	<b>Laboratory Management I:</b> Preparation of operating budgets; general aspects of financial management of laboratories; Cost-analysis (tests and instruments); justification of providing new services or rejecting existing ones; lease and purchase decision analysis; delegation of budget responsibilities, work load statistics.
8.	<b>Laboratory Management II: Laboratory safety:</b> Fire, chemical, radiation and infection control (body substance precautions), hazardous waste and transport of hazardous materials. Maintenance of records: Procedure manuals, ward manuals, quality control programs, patient data retrieval; Personnel management: Personnel policy manual; job descriptions; labor, supervision relations; conducting job interviews; motivation, recognizing job distress syndrome; delegation to a laboratory manager; Hospital organization; interactions between the laboratory service and the rest of the hospital.
9.	<b>Ethics in Laboratory Medicine:</b> Principles of ethics; General application of ethical principle; Collection of specimen; performance of tests; Reporting of results; Storage and retention of medical records; Access to medical records; Some special application.

**LEARNING SOURCE:** Self Learning Materials

**ADDITIONAL READINGS:**

- A. Sarah Jane Pitt, James M. Cunningham, “An Introduction to Biomedical Science in Professional and Clinical Practice”, John Wiley & Sons, 6 April 2009 Medical.
- B. Barbara H. Estridge, Anna P. Reynolds, Norma J. Walters, “Basic Medical Laboratory Techniques”, Cengage Learning, 2000.
- C. “Research Training in the Biomedical, Behavioural and Clinical Research Sciences” National Academics Press, 28 Feb 2011.

**WEB LINKS:**

- A. <http://www.mdx.ac.uk/courses/postgraduate/biomedical-science-clinical-biochemistry>.
- B. <http://www.uthsc.edu/grad/PROGRAMS/BCLRMMO.php>.
- C. <http://www.unimib.it/go/46156/Home/English/Academic-Programs/Medicine-and-Surgery/Biomedical-Laboratory-Techniques>

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