SYLLABUS PRIOR REVISION
FOR
BACHELOR OF SCIENCE
(MEDICAL LABORATORY TECHNIQUES)

SUSHIL KUMAR THAKUR

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BAREILLY INTERNATIONAL UNIVERSITY
FACULTY OF PARAMEDICAL SCIENCES

Syllabus

Bachelor of Science in Medical Laboratory Techniques (B.Sc. MLT)
(Session-2018-2019)

T.S. Marathekerappa
(Dr. T. Somashekerappa)

Ka Lea
(Dr. Chander Mohan)

Parbodh
(Dr. Parbodh Kumar)

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BAREILLY INTERNATIONAL UNIVERSITY, BAREILLY

ROHILKHAND COLLEGE OF PARAMEDICAL SCIENCES

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNIQUES
(B.Sc. MLT)-First Semester
SYLLABUS

Subject's Name

1. Human Anatomy-I
2. Human Physiology-I
3. Principles of Biochemistry-I
4. Basic Microbiology-I
5. Basic Pathology-I

Subsidiary Subject-

1. Basic Computers And Information Science

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Human Anatomy-I

Unit-I

Introduction: human body as a whole:

Definition of anatomy and its divisions.Terms of location, positions and planes.

Cell and its organelles: Epithelium-definition, classification, describe with examples, function Glands-classification, des;cribe serous & mucous glands with examples. Basic tissues- classification with examples.

Unit- II

Locomotion and support:

Cartilage- types with examples & histology

Bone- Classification, names of bones cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull

Joints- Classification of joints with examples, synovial joint (in detail for radiology)

Muscular system: Classification of muscular tissue & histology. Names of muscles of the body

Unit-III

Cardiovascular system:

Heart-size, location, chambers, exterior & interior, Blood supply of heart

Systemic & pulmonary circulation: Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse. Inferior venacava, portal vein, portosystemic anastomosis.Great saphenous vein, Dural venous sinuses

Lymphatic system – cistern chili & thoracic duct, Histology of lymphatic tissues, Names of regional lymphatics, Axillary and inguinal lymph nodes in brief.

Unit-IV

Nervous system:

Neuron, Classification of Nervous System, Cerebrum, cerebellum midbrain, pons, medulla oblongata, spinal cord nerve (gross & histology), Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Blood supply of brain, Cranial nerves, Sympathetic trunk & names of parasympathetic ganglia.

Unit-V

Endocrine glands:

Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, suprarenal gland – (gross & histology).

Unit-VI

Urinary system:

Kidney, ureter, urinary bladder, male and female urethra, Histology of kidney, ureter and urinary bladder.

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Human Physiology-I

Unit-I

Introduction – composition and function of blood.

Red blood cells – Erythropoiesis, stages of differentiation, function, count, physiological variation. Haemoglobin & Methods of Estimation of Hb. White blood cells – Production, concentration, types, albumin, globulin, fibrinogen, Prothrombin functions: Haemostasis& blood coagulation. Haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.

Blood Bank: Blood groups – ABO system, Rh system, Blood grouping & typing. Cross matching. Rh system: Rh factor, Rh in compatibility. Blood transfusion: indication, universal donor and recipient concept. Selection criteria of a blood donor. Transfusion reactions anticoagulants – Classification, example sand uses.

Anaemias: Classification: morphological and etiological effects of anaemia on body

Unit-II

Cardiovascular system

Heart – Physiological Anatomy, Nerve supply, Properties of Cardiac muscle. Cardiac cycle-systole, diastole, intraventricular pressure nerve. Cardiac Output – only definition. Heart sound, Normal heart sound, Areas of auscultation. Blood Pressure – Definition, normal value, clinical measurement of blood pressure, Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension. Pulse – Jugalar, radial pulse, Triple response. Heart sounds – Normal heart sounds, cause characteristics and signification, Heart rate Electrocardiogram (ECG) – significance.

Unit-III

Respiratory System.

Functions of Respiratory system, Physiological Anatomy of Respiratory system, Respiratory tract, Respiratory Muscles, Respiratory organ-lungs, Alveoli, Respiratory membrane, stages of respiration. Mechanism of normal and rigorous respiration, Forces and favoring expansion of the lungs, intra pulmonary pleural pressure, surface tension, recoil tendency of the wall.

Transportation of Respiratory gases: Transportation of Oxygen: Direction, pressure gradient, Forms of transportation, Oxygenation of Hb, Quantity of oxygen transported. Lung volumes and capacities: Regulation of respiration What? Why? How? Mechanisms of Regulation, nervous and

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chemical regulation, Respiratory centre. Hearing Reflexes. Applied Physiology and Respiratory : Hypoxia, Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiratory, Apnoea.

Unit-IV

Endocrine System:

Definition Classification of Endocrine glands & their Hormones

Properties of Hormones. Thyroid gland hormone – Physiological, Anatomy, Hormones secreted, Physiological function, regulation of secretion.Disorders – hypo and hyper secretion of hormone of adrenal gland, Adrenal cortex, physiologic anatomy of adrenal gland,

Adrenal cortex, cortical hormones – functions and regulation. Adrenal medulla- Hormones, regulation and secretion, functions of adrenaline and nor adrenaline. Pituitary hormones – Anterior and posterior pituitary hormones, secretion, function. Pancreas- Hormones of pancreas. Insulin – secretion, regulation, function and action.

Diabetes mellitus – Regulation of blood glucose level.Parathyroid gland – Function, action, regulation of secretion of parathyroid hormone. Calcification – function and action.

Unit- V

Excretory system:

Kidney: functions of kidneys, structural and functional unit nephron, vasa recta, cortical and juxtamedullary nephrons – Comparison, Juxta Glomerular Apparatus –structure and function, renal circulation peculiarities.

Mechanism of Urine formation: Ultrafiltration criteria for filtration GFR, Plasma fraction, EFP, factors effecting GFR, Determination of GFR selective reabsorption – sites of reabsorption, substance reabsorbed, mechanisms of reabsorption Glucose, urea.

H+Cl amino acids etc. TMG, Tubular lead, Renal threshold % of reabsorption of different substances, selective secretion. Properties and composition of normal urine, urine output.Abnormal constituents in urine, mechanims of urine concentration. Counter Current Mechanisms: micturition, innervation of bladder, cysteurethrogram.

Diuretics: Water, Diuretics, osmotic diuretics, artificial kidney, Renal function tests – plasma clearance, Actions of ADH, Aldosterone and PTH on kidneys. Renal function tests.

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Principle of Biochemistry-I

Unit-I

Introduction to Bio-chemistry including code of ethics for Medical lab technicians and Medical Lab Organisation.

Unit- II

Glassware and plastic ware used in a bio-chemical laboratory

Glass ware: Types of glass and composition. Types of glassware used their identification, application and uses. Cleaning, drying, maintenance and storage of glassware. Plastic ware: Brief outline.

Unit-III

Instrumental methods of bio-chemical analysis:

Colorimetry: Visual and photoelectric methods, instrumentation, principles and laws involved, construction, operation, care and maintenance, applications.

Spectrophometry: Principle and theory, types, construction, and applications.

Flame photometry: Principle and theory, types, construction, and application.

Unit-IV

Collection of specimens

I. Blood: Types of Specimens, Collection, Precautions during collection, Processing and preservation.

II. Urine: Types of specimens, Collection of 24 hours urine and preservation

Unit- V

Solution: Types based on solute and solvent, Types based on method of expressing concentration, Calculations

Unit-VI

Carbohydrates and lipids: Carbohydrates: Definition, Biological importance, Classification, Acid value, lodine value, Saponification value.

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Basic Microbiology-I

Unit-I

Historical introduction to Microbiology contribution of famous scientist in the filed of Microbiology in brief. Anatomy Van Lee wen Hook, Robert Koch, Edward Jenner, Louis Pasteur, Joseph Lister

Unit-II

Microscopes

Principle working and maintenance of compound microscope. Principle of Fluorescent Microscope, Electron Microscope, Dark Ground Microscope.

Unit-III

Sterilization and disinfection

Definition, classification and methods of sterilization

Principle and method of sterilization by heat. By Dry Heat, Flaming, Red Heat, Hot air oven, incineration By Merit Heat-pasteurization, Inspissations, Tyndalisation, Autoclave

Filtration Methods: Ionizing Radiation-Disinfection, Mode of action and uses of important chemical disinfection-Phenol and Phenolic compounds, alcohols, halogens, dyes and acids and alkalis.

Gaseous Methods of sterilization.

Unit-IV

Cleaning, drying & Sterilization of Glassware disposal of contaminated material i.e. clinical infective material inoculated culture media, Handling and Disposal of Biomedical waste.

Unit-V

Equipments used in microbiology

General instruments. Microbiological : autoclave, incubator, Hot air oven, Laminar air flow, Refrigerator inoculators, Mac intoshfield's Jar. Other instruments: Electrophoresis, Chromatography ELISA, RIA, Etc.

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Basic Pathology-I

Unit-I

Introduction to pathology:

Definition , Types of Laboratory, History of pathology Laboratory organization, general laboratory safety measures.

Unit-II

Instruments and glass wares used in hematology. Introduction, types, composition, working Principle, used, maintenance , merit and demerits

Unit- III

Sample collection and Anticoagulants

Methods of collection, sample labeling, preparation, storage, transport, handling and disposal.

Anticoagulants – mechanism of action, composition, merits, demerits, uses, changes taking place in blood on storage EDTA, heparin fluoride, ACD, CPDA, double oxalate, sodium citrate.

Unit- IV

Blood: Formation, composition, functions, normal values and physiological variation of cellular constituents.

Unit-V

Romanowsky stains & Solutions

Types, composition preparation of stains, function of individual constituents. Normality molarity, solutions and buffers used in hematology.

Unit- VI

Hemoglobin&Hemoglobinometry

Struecture and function, synthesis, types, breakdown. Various methods, sources of errors, remedies, standardization of methods and instruments, merits and demerits of various methods.

Unit- VII

Hemocytometry

General introduction of Hemocytometer, Diluting fluids, Errors, precautions to be taken in Total leukocyte count, RBC count, Platelet count, Absolute Eosinophil count.

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Basic computers and information science

Unit- I

Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Unit- II

Processor and memory: The Central Processing Unit (CPU), main memory.

Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit- III

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit- IV

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Unit- V

Introduction of Operating System: introduction, operating system concepts, types of operating system

Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Unit- VI

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in clinical settings.

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Practical

Human Anatomy-I

1. Histology of types of epithelium
2. Histology of the 3 types of cartilages
3. Demo of all bones showing parts, radiographs of normal bones & joints.
4 .Histology of compact bone (TS & LS)
5. Microscopic appearance of large artery, medium sized artery & vein, large vein pericardium.
6. Normal chest radiographs showing heart shadow
7. Demonstration of reflections
8. Demonstration of parts of urinary bladder
9. Histology of pituitary, thyroid, parathyroid, suprarenal glands

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Human Physiology-I

1. Haemoglobinometry
2. White Blood Cell count
3. Red Blood Cell count
4. Determination of Blood Groups
5. Leishman's staining and Differential WBC count
6. Determination of packed cell Volume
7. Erythrocyte sedimentation o rate (ESR)
8. Determination of Clotting Time, Bleeding Time

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Principle of Biochemistry-I

1. Introduction. Aim, basis, interpretation. Hazards and safety measure and first aid in laboratory accidents.
2. Laboratory organization: Use, care and maintainance/cleaing of various, instruments/glassware, routine tests (introduction), Units of measurement Analytical balance, Colorimetry, spectrophotometry, flame photometry (principles, instrumentation and application).
3. Preparation of buffers.
4. Colorimetry and spectrophotometry – Principle and demonstration.
5. Collection of specimen: Urine, blood, gastric juice, ascitic fluid
6. Tests for Carbohydrates (qualitative tests).
7. Tests for lipids.

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Basic Microbiology-I

1. Laboratory visit
2. Demonstration of various Instruments
3. Sample Collections
4. Smear preparation
5. Introduction of different staining methods
6. Simple staining (methylene blue)
7. Grams staining
8. Sterilization of glasswares

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Basic Pathology-I

1. Preparation of anticoagulant for various biochemical & hematological investigation.
2. Preparation of stains (Leishman's stain, giemsa) & buffer solution.
3. Estimation of hemoglobin by Sahli's Method
4. Estimation of hemoglobin by Cynmethaemoglobin Method
5. Total Erythrocyte count by hemocytometer.
6. Total leucocytes count by hemocytometer.
7. Platelet count by hemocytometry
8. Absolute Eosinophil Cout.

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BAREILLY INTERNATIONAL UNIVERSITY

(B.Sc. MLT)-Second Semester

SYLLABUS

Subject's Name

1. Human Anatomy-II
2. Human Physiology-II
3. Principles of Biochemistry-II
4. Basic Microbiology-II
5. Basic Pathology-II

Subsidiary Subject-

1. English, Communication And Soft Skills

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Human Anatomy-II

Unit-I

Gastro-intestinal system

Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring). Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas Radiographs of abdomen

Unit-II

Respiratory system

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments

Histology of trachea, lung and pleura, Names of paranasal air sinuses.

Unit- III

Peritoneum

Description in brief

Unit-IV

Reproductive system

Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology)

Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology), Mammary gland – gross.

Unit- V

Sensory organs:

Skin: Skin-histology, Appendages of skin

Eye: Parts of eye & lacrimal apparatus, Extra ocular muscles & nerve supply

Ear: parts of ear-external, middle and inner ear and contents.

Unit- VI

Embryology

Spermatogenesis & oogenesis, Ovulation, fertilization, Fetal circulation, Placenta

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Human Physiology-II

Unit- I

Digestive system – Physiological anatomy of gastro intestinal tract, functions of digestive system, salivary glands structure and functions, deglutination – stages and regulation

Stomach – structure and functions. Gastric secretion – Composition function regulation of gastric juice secretion

Pancrease- structure, function, composition, regulation of pancreatic juice. Liver – functions of liver.

Bile secretion, composition, function regulation of bile secretion. Bilirubin metabolism types of bilirubin, Vandernberg reaction, Jaundice- types, significance. Gall bladder – Function

Intestine – small intestine and large intestine. Small intestine – Functions, digestive, absorption, movements. Large intestine – Functions, digestion and absorption of Carbohydrates, Proteins, Fats, Lipids, Defecation.

Unit- II

Special senses

Vision – structure of eye, function of different parts. Structure of retina. Hearing – structure and function of ear, mechanism of hearing. Taste – Taste buds functions, smell physiology, receptors.

Unit- III

Nervous system

Function of nervous system, neuron structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and salutatory.

Velocity of impulse transmission and factors affecting. Synapse – structure, types, properties. Receptors Definition, classification, properties. Reflex action unconditioned properties of reflex action, Babinski's sign. Spinal cord nerve tracts. Ascending tracts, Descending tracts –

Pyramidal tracts – Extrapyramidcal tracts. Function of medulla, pons, hypothalamic

Disorders, Cerebral cortex lobes and function, Sensory cortex, Motor cortex, Cerebellum functions of Cerebellum. Basal ganglion- function. EEG.

Cerebro Spinal Fluid (CSF): formation, circulation, properties, composition and functions, lumbar puncture. Automatic nervous system: Sympathetic and parasympathetic distribution and functions and comparison of functions.

Diuretics: Water, Diuretics, osmotic diuretics, artificial kidney, Renal function tests – plasma clearance, tions of ADH, Aldosterone and PTH on kidneys. Renal function tests.

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Unit- IV

Reproductive system

Function of Reproductive system, puberty, male reproductive system, Function of testes, Spermatogenesis site, stages, factors influencing semen, Endocrine functions of tests, Androgens Testosterone structure and functions. Female reproductive system. Ovulation, menstrual cycle. Physiology changes during pregnancy, pregnancy test. Lactation: Composition of milk factors controlling lactation.

Unit- V

Muscle nerve physiology

Classification of muscle, structure of skeletal muscle, sarcomere contractile proteins, Neuromuscular junction. Trasmission across, Neuromuscular junction, Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue Rigo mortis.

Unit- VI

Skin-structure and function

Body temperature measurement, Physiological variation, Regulation of body Temperature by physical chemical and nervous mechanism. Role of Hypothalamus, Hypothermia and fever.

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Principles of Biochemistry-II

Unit-I

Reception, Registration and bio-chemical parameters investigated

Basic lab operations like- Separation of Solids from liquids, Centrifugation: Principle, Different types of Centrifuges care and maintenance, application, Filtration using funnel,Weighing: Different types of balances used, care and maintenance.

Unit-II

Diagnostic tests-Blood sugar, Glucose tolerance test, Blood urea, Serum uric acid, Serum creatinine.

Unit- III

Measurement: Units of measurements, Weighing/measurement of different chemicals, liquid, Molecular weight, equivalent weight, normally, molarity, preparing molar/normal solution, Diluting solutions, Preparation and storage of reagents, stain sorters of dard solution and buffers.

Unit-IV

Acid base balance concepts & di-pH, Buffers, Acidosis, Alkalosis, Enderson-Hasselbach equation and its clinical application.

Unit-V

Body fluids: Biochemical composition and physiological variation. Blood/Urine chemistry and its constituents. Pathological changes. Collection of Blood/Urine/CSF/ascitic fluid specimen. Used of preservatives and anticoagulants.

Unit- VI

Amino acids and Proteins-Definition, Biological importance, Classification, Qualitative tests.

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Basic Microbiology-II

Unit- I

Morphology and classification of Bacteria Sp. of cell, capsule, flagella, spore, Anaerobic Methods of cultivation of Bacteria.

Unit- II

Methods of Collection of clinical specimen for micro-Biological investigation (indetail) like sputum-pettroff 's method of concentration, urine, swabs, stool, blood, CSF and aspirations.

Unit-III

Processing of clinical specimen collected for isolation and identification of organism

Preparation of direct smear and staining, Hanging drop preparation and its use, Inoculation of various media for Bio-chemical reactions

Unit-IV

Composition and preparation of staining reagents and different methods of staining-Simple staining, Gram staining, Spore staining, Capsular staining, ZeihlNeelson staining, Albert staining, Negative staining, Flagellar staining, Fluorescent staining

Unit- V

Culture Media- Classification of Media composition and preparation and uses-Basal Media – peptone water, Nutrient broth, glucose broth, Enriched media – Blood agar, loefflers serum slope, chocolateagar, Enriched media – Selenitesbrowth, tetrathinotebroth alkaline peptone water, Differential media – Maconkeys media, Selective media – Lowenstcin Jenson Media, Potassium tellurite media, TCbS, Wilson and Blair Media, Deoxycholate citrate agar media, Blood culture media – Glucose broth, Hartleys broth, Bile broth Sugar Media for Bio-chemical Reaction. Rebertson cooked Meat Media, thioglycolate media, Media and Reagents for differents Biochemical reaction i.e. indole test, V.P. tests, M.R. Test, Citiate, uerase, triple sugar, iron agar, Oxidase, catalase test, Nitrate eduction test, Pheny alkaline, deaminase test, glucose phosphate broth, gelatin liquefaction. Sabourauds dextrose Agar, PDA.

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Basic Pathology-II

Unit-I

Packed cell volume, ESR, Red cell indices.

Preparation & staining of thin and thick blood smears,

Reticulocytes, Reticulocytes staining and count.

Unit-II

Morphology of RBCs, WBCs, Platelets,

Differential leucocytes counts.

Buffy coat preparation & LE cell

Unit-III

Hemostasis, Bleeding time, Clotting time, Prothrombin time, Activated partial Thromboplastin time,

Unit-IV

Urine – formation, composition, sample collection, labeling, preparation, transportation, disposal, physical examination, quantitative detection of protein, sugar, bile salts, bile pigments, urobilinogen, ketone bodies, blood, chyle, Bencelones, proteins, other reducing sugars.

Unit-V

Donor registration, selection and organization of blood bank.

Blood groups – Landsteiners contributions, ABO, Rh system, other blood group system, ABO, Rh typing.

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English, Communication And Soft Skills

Basic Language Skills: Grammar and Usage.

Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.

Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.

Basic concepts & principles of good communication.

Special characteristics of health communication.

Types & process of communication – verbal, non-verbal and written communication.

Upward, downward and lateral communication.

Therapeutic communication: empathy versus sympathy.

Communication methods for teaching and learning.

Communication methods for patient education.

Barriers of communication & how to overcome.

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Practical

Human Anatomy-II

1. Histology of lymph node, spleen, tonsil & thymus.
2. Normal radiographs of chest
3. Demonstration of parts of respiratory system.
4. Demonstration of reflections
5. Radiographs of abdomen-IVP, retrograde cystogram
6. Radiographs of pelvis- hysterosalpingogram
7. Demonstration of the glands
8. Histology of thin and thick skin
9. Histology of cornea & retina

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Human Physiology-II

1. Blood pressure Recording
2. Auscultation for Health Sounds
3. Artificial Respiration
4. Determination of vital capacity

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Principle of Biochemistry-II

1. Study of enzyme activity
2. Precipitation reactions of proteins.
3. Study of enzyme activity
4. Urine analysis – test for normal and abnormal constituents
5. Centrifugation : Principle types, & applications.
6. Estimation of blood/serum glucose, creatiine, urea, cholesterol, total protein, bilirubin, GTT, GCT.

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Basic Microbiology-I

1. Introduction of various Culture media
2. Preparation of Various Culture Media
3. Colony morphology
4. Hanging drop preparation
5. Stool Examination
6. Gram Staining
7. Spore staining
8. Capsular staining
9. ZeihlNeelson staining
10. Albert staining
11. Negative staining
12. Flagellar staining
13. Fluorescent staining

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Basic Pathology-II

1. Study of Morphology of blood cells.
2. Determination of hematocrit (PCV), MCV, MCH, MCHC, ESR, colour, index.
3. Determination of platelets count, Reticulocytes count, Absolute Eosinophil count.
4. Determination of Malariaparasite, Filarial parasite.
5. Determination of blood cloting time, bleeding time, prothrombin time, activatd partial thromboplastin time.
6. ABO-Rh typing
7. Urine Examination:- Physical examination, Chemical examination. Determination of ketones, bile salt, bile pigments, urobiliogen occult blood, B. J. Proteins. Microscopic examination.
8. Preparation of Buffy coat & L.E. cell.

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BAREILLY INTERNATIONAL UNIVERSITY

(B.Sc. MLT)-Third Semester

SYLLABUS

Subject's Name

1. Biochemical Metabolism
2. Applied Clinical Biochemistry-I
3. Systemic Bacteriology
4. Basics of Haematological Diseases-I
5. Fundamental of Histopathology

Subsidiary Subject-

1. Introduction to Quality and Patient Safety

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BAREILLY INTERNATIONAL UNIVERSITY

Biochemical Metabolism

Rationale: This subject shall give information about all the major metabolic pathways occurring in our body. The students will learn the details about metabolism of carbohydrates, proteins, lipids, nucleic acids, enzymes & the deficiency diseases related to them.

Unit- I

Carbohydrate Metabolism

Introduction, Importance and Classification, Digestion and Absorption , Metabolism: - Glycolysis, Citric acid cycle, Gluconeogenesis, Glycogenolysis, Glycogenesis , Disorders of carbohydrate metabolism.

Unit- II

Protein Metabolism

Introduction, Importance and classification , Important properties of proteins, Digestion & absorption of Proteins , Protein synthesis , Metabolism of proteins, Disorders of protein metabolism and Urea Cycle.

Unit- II

Lipid Metabolism

Introduction & Classification , Digestion & absorption of fats , Lipoproteins , Fatty acid biosynthesis & fatty acid oxidation.

Unit- III

Nucleic Acid

Introduction , Functions of Nucleic acid , Functions of energy carriers.

Unit- III

Enzymes

Introductions, Importance & Classifications , Properties of enzymes , Mechanism of enzyme action, Factors affecting enzyme action , Enzyme kinetics & enzyme inhibiters.

Suggested Readings

Practical Clinical Biochemistry by Harold Varley
Text book of Medical Laboratory Technology by P. B. Godker

Medical Laboratory Technology by Mukherjee
Principal of Biochemistry by M. A. Siddiqi

Instrumental Analysis by Chatwal Anand
Text book of Medical Biochemistry by Chaterjee, Shinde

Principal of Biochemistry by Lehninger

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BAREILLY INTERNATIONAL UNIVERSITY

Applied Clinical Biochemistry-I

Rationale: The students will be taught about Hazards & safety measures in a clinical biochemistry lab, Quality control and quality assurance, Laboratory organization, management Principles of assay procedures and Radioactivity.

Unit-I

Hazards & safety measures in clinical Biochemistry laboratory

Quality control and quality assurance in a clinical biochemistry laboratory

Laboratory organization, management and maintenance of records.

Unit-II

Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for:
Glucose , Proteins , Urea , Uric acid , Creatinine , Bilirubin , Lipids.

Unit-III

Principles, procedures for estimation & assessment of the following including Erors involved and their corrections-
Sodium, Potassium and Chloride, Iodine , Calcium, Phosphorous and Phosphates.

Unit-IV

Instruments for detection of Radioactivity
Applications of Radioisotopes in clinical biochemistry.

Enzyme linked immune sorbent assay.

Suggested Readings

Text book of Medical Laboratory Technology by P.B. Godkar.

Medical Laboratory Science, Theory & Practical by A. Kolhatkar.
Practical Clinical Biochemistry by Harold Varley.

Biochemistry, U. Satyanarayan& U. Chakrapani.
Text book of Medical Biochemistry by Chatterjee&Shinde.

Principal of Biochemistry by Lehninger
Biochemistry by Voet&Voet

Biochemistry by Stryer

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Systemic Bacteriology

Rationale: This subject will give information about the different types of bacterial culture procedures, staining procedures and biochemical tests used for identification of bacteria. The students will learn the morphology cultural characteristics, biochemical characteristics & laboratory diagnosis of various bacteria.

Unit-I

Bacterial culture & Staining techniques in bacteriology

Instruments used to seed culture media , Culture procedures – seeding a plate.

Significance of staining in bacteriology-

Principle, Reagent preparation, procedures and interpretation of- Simple staining, Gram staining , Negative staining, Albert's staining , Neissre's staining , Ziehl- Neelsen staining, Capsule staining , Spore Staining , Flagella staining , Fontana stain for spirochetes.

Unit-I I

Principle, procedures and interpretation of the following biochemical tests for identification of different bacteria.

Catalase , Coagulase , Indole , Methyl Red , VogesProskauer , Urease , Citrate , Oxidase

TSIA , Nitrate reduction , Carbohydrate fermentation , Huge and Leifson , Bile solubility

H 2 S production , Demonstration of motility , Decarboxylases , CAMP , Hippurate hydrolysis , Nagler's reaction , Cholera-red reaction.

Unit-III

Definition, Classification, Various characteristics (morphological, cultural and biochemical), pathogenesis and laboratory diagnosis of the following bacteria-

Staphylococcus , Streptococcus , Pneumococcus , Neisseria gonorrhea and Neisseria meningitis , Haemophilis , Corynebacterium ,

Enterobacteriaceae: Escherichia coli, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia enterocolitica and Yersinia pestis .

Vibrio, Aeromones and Plesiomonas , Clostridia of wound infection , Mycobacterium tuberculosis complex, Atypical Mycobacteria and M. leprae

Spirochetes – Treponema, Borrellia and leptospira

Bordetella and brucella , Mycoplasma and Ureaplasma , Rickettsia , Chlamydia ,

Actinomyces , Pseudomonas and Burkholderia , Brief introduction about non sporing anaerobic cocci and bacilli

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Suggested Readings:

Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2

Text book of Microbiology by Ananthanarayanan
Medical Microbiology by Paniker& Satish Gupte

Medical laboratory Technology Vol. I, II, III by Mukherjee

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Basics of Haematological Diseases-I

Rationale: The students will be made aware of various diseases like anemia, quantitative disorders of Leucocytes, morphological alterations in blood cells, bleeding disorders.

Unit- I

Anaemia

Introduction , Classification , Microcytic hypochromic anemia , Macrocytic anemia ,

Normocytic normochromic anemia.

Unit- II

Quantitative disorders of Leukocytes Cause and significance

Granulocytic and Monocytic Disorders , Lymphocytic Disorders , Morphologic Alterations in Neutrophils ,Toxic granulation , Cytoplasmic vacuoles , Döhle bodies , May–Hegglin anomaly Alder–Reilly anomaly , Pelger–Huët anomaly , Chédiak–Higashi syndrome.

Unit- III

Bleeding disorders

Introduction Causes of bleeding disorders , Vascular defect , Platelet defect , Factor deficiency

Inhibitors , Hyper fibrinolysis , Types of bleeding disorders , Inherited bleeding disorders , Acquired bleeding disorders.

Unit- IV

Thrombosis

Introduction , Causes of thrombosis , Monitoring of Anticoagulants , Oral anticoagulants by INR , Heparin.

Suggested Readings

Textbook of Medical Laboratory Technology by Praful B. Godkar

Medical Laboratory Technology by K L Mukherjee Volume-I
Practical Haematology by J.B. Dacie

Clinical Diagnosis & Management by Laboratory methods (20thedition) by John Bernard Henry

Atlas of Haematology by G.A. McDonald
De Gruchy's clinical Haematology in medical practice

Wintrobe's Clinical Haematology– 2013 by John P. Greer, Daniel A. Arber, Bertil E. Glader, Alan F. List

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Fundamental of Histopathology

Rationale: The student will study diseases associated with different body organs and systems.

Unit-I

Alimentary & Digestive System

Diseases of mouth, Diseases of Esophagus- Esophageal varices.

Digestive System: Gastritis, Peptic ulceration, Appendicitis microbial diseases, food poisoning, hernia, Intestinal obstructions & mal absorption.

Accessory Digestive glands: Salivary glands- mumps Liver – hepatitis, liver failure, cirrhosis.

Pancreas- pancreatitis.

Gall Bladder- Gall stones, jaundice and cardiovascular diseases..

Unit-II

Circulatory & Respiratory System

Diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block. Disorders of Blood Pressure-Hyper & Hypotension.

Respiratory System: Upper respiratory tract infection, Bronchi, Asthma, Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.

Unit-III

Urinary & Reproductive System

Glomerulonephritis, Nephrotic syndrome, renal failure, renal calculi, Urinary obstruction, Urinary tract infection.

Reproductive system: Sexually transmitted diseases, Pelvic inflammatory disease, disorder of cervix (CIN), Disease of ovaries, ectopic pregnancy, prostatitis, Infertility.

Unit-IV

Nervous , Endocrine System & Sense Organs

Neuronal damage, ICP, Cerebral Infarction, head injury, Alzheimer's disease, dementia.

Endocrine System , Pituitary: Hyper & Hypo secretions.
Thyroid: Goiter , Adrenal: Cushing Syndrome, Addison Disease , Pancreas: Diabetes.

Ear: Otitis , Eye: Cataract.

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Suggested readings

Anatomy &Physiology – Ross and Wilson

Human Anatomy and Physiology by Pearce

Di Fiore's Atlas of Histology

Medical Laboratory Technology by KL Mukherjee-Volume III

Text book of Pathology by Robbins

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Introduction to Quality and Patient safety

Introduction to Quality and Patient safety (including Basic emergency care and life support skills, Infection prevention and control, Biomedical waste management, Disaster management and Antibiotic resistance).

Rationale: The subject will introduce the students to the basic concepts of quality in health care and develop skills to implement sustainable quality assurance program in the health system. It will sensitize them in basic emergency care, infection prevention & control with knowledge of bio-medical waste management and antibiotic resistance.

Unit-I

Quality assurance and management - The objective of the subject is to help students understand the basic concepts of quality in health care and develop skills to implement sustainable quality assurance program in the health system.

Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Quality Improvement Tools, Introduction to NABH guidelines.

Unit-II

Basics of emergency care and life support skills – Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED). Initial recognition and response to heart attack and stroke are also considered part of BLS. The student is also expected to learn about basic emergency care including first aid and triage. Topics to be covered under the subject are as follows:

Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR, Using an AED (Automated external defibrillator)., Managing an emergency including moving a patient.

Unit-III

Bio medical waste management and environment safety – The aim of this section will be to help prevent harm to workers, property, the environment and the general public. Topics to be covered under the subject are as follows:

Definition of Biomedical Waste, Waste minimization, BMW – Segregation, collection, transportation, treatment and disposal (including color coding), Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste, BMW Management & methods of disinfection, Modern Technology for handling BMW, Use of Personal protective equipment (PPE), Monitoring & controlling of cross infection (Protective devices).

Unit-III

Infection prevention and control – The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental

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skills required to reduce the incidence of hospital acquired infections and improve health outcomes. Concepts taught should include –

Evidence-based infection control principles and practices [such as Sterilization, Disinfection, Effective hand hygiene and use of Personal Protective Equipment (PPE)], Prevention & control of common healthcare associated infections, Components of an effective infection control program, and Guidelines (NABH and JCI) for Hospital Infection Control.

Unit-IV

Antibiotic Resistance-

History of antibiotics, How resistance happens and spreads, Types of resistance- intrinsic, acquired, passive, Trends in drug resistance, Actions to fight resistance, Bacterial persistence

Antibiotic sensitivity, Consequences of antibiotic resistance, Antimicrobial Stewardship – Barriers and opportunities, tools and models in hospitals.

Unit-V

Disaster preparedness and management – The objective of this section will be to provide knowledge on the principles of on-site disaster management. Concepts to be taught should include-

Fundamentals of emergency management, Psychological impact management, Resource management, Preparedness and risk reduction, Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command.

Suggested readings:

The Essentials of Patient Safety by Charles Vincent

Laboratory quality control and patient safety by De Gruyter

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Practical

Biochemical Metabolism

1. To determine the presence of carbohydrates by Molisch test.

2. To determine the presence of reducing sugar by Fehling solutions.
3. To determine the presence of reducing sugar by Benedicts method.

4. To determine starch by Iodine test.
5. Determination of Glucose in serum & plasma.

6. Estimates of blood Glucose by Folin& Wu method.
7. Determination of Urea in serum, plasma & urine.

8. Determination of Creatinine in serum or plasma.
9. Determination of serum Albumin.

10. Determination of Cholesterol in serum or plasma.
11. To measure electrolytes Sodium, Potassium & Chloride.

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Applied Clinical Biochemistry- I

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.

3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.

5. Estimation of serum Bilirubin
6. Estimation of Total Cholesterol in blood.

7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol.

9. Estimation of TG
10. Estimation of Creatinine in Blood

11. Estimation of serum calcium, Inorganic phosphate

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Systemic Bacteriology

1. To demonstrate the instruments used to seed culture media
2. To learn techniques for Inoculation of bacteria on culture media
3. To isolate specific bacteria from a mixture of organisms.
4. To demonstrate simple staining (Methylene blue).
5. To prepare India ink preparation to demonstrate negative staining.
6. Bacterial identification: To demonstrate reagent preparation, procedure and interpretation for Demonstration of flagella by staining methods , Spore staining , To demonstrate spirochetes by Fontana staining procedure
7. To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria:

   Catalase , Coagulase, Indole , Methyl Red (MR) , VogesProskauer (VP) , Urease , Citrate ,

   Oxidase , TSIA, Nitrate reduction, Carbohydrate fermentation , Huge and Leifson , Bile solubility, H2S production , Demonstration and motility , Decarboxylases , CAMP

8. To demonstrate various characteristics (morphological, cultural and biochemical) of bacteria commonly isolated from clinical samples i.e.-

   Staphylococcus , Streptococcus , Corynebacterium , Escherichia coli , Klebsiella , Citrobacte,

   Enterobacter , Proteus , Salmonella , Shigella , Vibrio cholera , Mycobacterium tuberculosis

   Pseudomonas.

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Basics of Haematological Diseases –I

1. Recognition and staining of various types of blood cells (normal and abnormal).
2. Preparation of thick and thin blood smear for malarial parasite (Leishman/Giemsa/JSB)
3. WBC counting
4. DLC count
5. PT, APTT
6. Platelet counting
7. Routine Examination of urine

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Fundamental of Histopathology

1. To study squamous cell from cheek cells (Buccal mucosa)
2. To study stained slide preparation from organs of digestive system
3. Study of stained slides of liver, pancreas, gall bladder
4. Study of various types of microscope and draw diagram in practical notebook
5. To study stained slide preparation from organs of circulatory system
6. To study stained slide preparation from organs of Respiratory system
7. To study stained slide preparation from organs of Nervous system
8. To study stained slide preparation from organs of Urinary system
9. To study stained slide preparation from organs of Endocrine system

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(B.Sc. MLT)-Fourth Semester
SYLLABUS

Subject's Name

1. Applied Clinical Biochemistry-II
2. Applied Bacteriology
3. Medical Parasitology & Entomology
4. Basics of Haematological Diseases-II
5. Cytopathology & Cytotechniques

Subsidiary Subject-

1. Basic Preventive Medicine and Community Health Care

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Applied Clinical Biochemisty-II

Rationale: The students will learn how to analyze various clinical patients' samples, for estimation of different components which are the cause of the disease or are the diagnostic/prognostic markers. This subject gives information about various clinically important enzymes & automation techniques.

Unit- I

Automation in clinical biochemistry

Method of estimation and assessment for:

Glucose tolerance test , Insulin tolerance test, Xylose excretion test. ,Gastric analysis.
Clearance test for renal function.

Unit- II

Qualitative test for:

Urobilinogens , Barbiturates , T3, T4 and TSH , Ketosteroids

Unit- III

Enzymes Principles , Clinical significance and Procedures for estimation:
Acid phosphatase , Alkaline phosphatase , Lactate dehydrogenase , Aspartate transaminase

Alanine transaminase , Creatine phosphokinase.

Unit- IV

Qualitative analysis of Renal calculi.
Chemical examination of Cerebrospinal fluid.
Brief knowledge about rapid techniques in clinical biochemistry.

Suggested Readings

Text book of Medical Laboratory Technology by P.B. Godkar.
Medical Laboratory Science, Theory & Practical by A. Kolhatkar.

Practical Clinical Biochemistry by Harold Varley.
Biochemistry, U. Satyanarayan& U. Chakrapani.

Text book of Medical Biochemistry by Chaterjee&Shinde.
Principal of Biochemistry by Lehninger

Biochemistry by Voet&Voet

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Applied Bacteriology

Rationale: This part will cover the laboratory strategy in the diagnosis of various infective syndromes i.e. choice of samples, collection and transportation and processing of samples for isolation of bacterial pathogens and then to put antibiotic susceptibility testing. This will also cover bacteriological examination of water, milk, food, air, I/V fluids and nosocomial infections. Further it will make the candidate familiar to epidemiology, epidemiological markers and preservation of microbes.

Unit- I

Laboratory strategy in the diagnosis of various infective syndromes: Samples of choice, collection, transportation and processing of samples for laboratory diagnosis of the following complications:

Septicemia and bacteremia , Upper Respiratory tract infections , Lower respiratory tract infections, Wound, skin, and deep sepsis ,Urinary tract infections , Genital Tract infection, Meningitis , Gastro intestinal infections , Enteric fever, Tuberculosis (Pulmonary and Extra-pulmonary), Pyrexia of unknown origin.

Unit- II

Antibiotic susceptibility testing in bacteriology-

Definition of antibiotics, Culture medium used for Antibiotic susceptibility testing, Preparation and standardization of inoculums , Control bacterial strains ,Choice of antibiotics ,MIC and MBC ,Concepts and methods for determination , Various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method.

Unit- III

Basics of Nucleic acid techniques in diagnostic microbiology with special reference to Polymerase chain reaction (PCR)

Automation in bacterial culture detection and antimicrobial susceptibility testing: Principles and importance.

Unit- IV

Bacteriological examination of water, milk, food and air-

Examination of water- Collection and transportation of water sample, Presumptive coliform count , Eijkman test.
Introduction and importance of other bacteria considered as indicators of fecal contamination-
Membrane filtration tests , Interpretation of results.

Examination of Milk and milk products- Basic Concepts regarding gradation of milk ,Various tests for Bacteriological examination of milk , Examination of food articles.

Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc.

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Various tests for Bacteriological examination with special reference to food poisoning bacteria Examination of Air- Significance of air bacteriology in healthcare facilities, Settle plate method Types of air sampling instruments ,Collection processing and reporting of an air sample.

Sterility testing of I/v fluids- Collection, transportation and processing of I/v fluids for bacterial contamination , Recording the result and interpretation.

Unit- V

Nosocomial Infection:
Introduction, sources and types of nosocomial infections , Surveillance of hospital environment for microbial load , Role of microbiology laboratory in control of nosocomial infections.

Unit- VI

Epidemiological markers:
Introduction ,Types , Serotyping , Phage typing and Bacteriocin typing ,Preservation methods for microbes , Basic concepts of preservation of microbes , Why do we need to preserve bacteria? , Principle and procedures of various short term and long term preservation methods with special reference to Lyophilization.

Suggested Readings:

Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2
Text book of Microbiology by Ananthanarayanan

Medical Microbiology by Paniker& Satish Gupte
Medical laboratory Technology Vol. I ,II, III by Mukherjee

Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough

Hospital Acquired Infections-Power strategies for clinical practice by Dr. V Muralidhar and SumathiMurlidhar

Control of Hospital infection-A practical Handbook by GajAyliffe, A.P. Fraise, A.M. Geddes, K. Mitchell

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Medical Parasitology & Entomology

Rationale: The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important parasites.

Unit- I

Introduction to Medical Parasitology with respect to terms used in Parasitology.
Protozoology/ Protozoal parasites:
General characteristics of protozoa, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba sp.

Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Intestinal and vaginal flagellates i.e. Giardia, Trichomonas sp.

Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp.

Unit- II

Helminthology/ Helminthic parasites:

General characteristics of Cestodes, Trematodes and Nematodes.

Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of -Taeniasolium and saginata, Echinococcusgranulos, Hymenolepis nana,

Schistosoma haematobium and mansoni, Fasciola hepatica and buski ,Trichuristrichura, Trichinellaspirales, Strongyloidesstercoralis , Ancylostomaduodenale , Enterobiusvermicularis

Ascarislumbricoides, Wuchereriabancrofti , Dracunculusmedinensis.

Unit- III

Diagnostic procedures:
Collection of stool samples, Preparation of material for unstained and stained preparations Staining methods i.e. Iodine staining and permanent staining , General rules for microscopic examination of stool samples , Examination of Stool for parasites , For intestinal protozoal infections , For Helminthic infections , Introduction, direct smear preparation and examination, Concentration techniques i.e. Flotation and sedimentation techniques , Egg counting techniques

Examination of blood for parasites , Preparation of thin and thick blood film , Leishman staining

Examination of thick and thin smear , Field's stain , JSB stain.

Unit- IV

Examination of blood film for Malarial parasite and Microfilariae.
Collection, Transport, processing and preservation of samples for routine parasitological investigations
Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba.

Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms

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Morphology, life cycle and lab-diagnosis of T. solium and T. saginata.

Morphology, life cycle and lab-diagnosis of Malarial parasite with special reference to P.vivax and P. falciparum.

Laboratory diagnosis of hydated cyst and cysticercosis.
Concentration techniques for demonstration of Ova and Cysts (Principles and applications).

Suggested Readings

Parasitology in relation to Clinical Medicine by K D Chhatterjee

Medical Entomology by A.K. Hati, Pub. Allied Book Agency
Medical Parasitology by D.R. Arora

Clinical Parasitology by Paul Chester Beaver

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Basics of Haematological Diseases-II

Rationale: The students will be made aware of different types of anemia, Leukemia ,Bone marrow, Study and Diagnosis of Various Body Fluids.

Unit-I

Anaemias :-

Definition , causes, changes in blood morphology due to the following anaemias and special tests-

Iron deficiency anemia, Thalassemia, Megaloblastic anaemia,Aplastc anaemia, Sideroblastic anaemia Sickle cell anaemia, Autoimmune hemolytic anaemia, Hereditary spherocytosis, G6PD deficiency anaemia, Sickling test, Osmotic fragility test, HbF , HbA2, electrophoresis, B12 ,folate assay, Schilling test, Serum Iron, Iron binding capacity, S.feritin tests for Hemolytic anaemias.

Unit-II

Quantitative changes in white blood cells & their causes.
Definitions, morphology, identification of various abnormal cells in common Leukemia's – CML, CLL, AML, ALL, plasma cell myeloma.

Unit-III

Bone marrow :- Composition, function, aspiration techniques, smear preparation, routine staining with MGG.

Unit-IV

Clinical pathology :-
CSF and other body fluids :- Normal composition, production, normal values, physiological alteration, sample collection, preservation, storage, handling, processing and disposal of CSF, Ascetics fluid, Plural fluid , Pericardial fluid , Synovial fluid.
Seminal fluid analysis: Normal semen, production, composition, specimen handling and disposal of sample, physical examination, chemical and microscopic examination, sperm concentration techniques.

Suggested Readings

Text book of Medical Laboratory Technology by Paraful B. Godkar
Medical laboratory Technology by KL Mukherjee Volume-I
Practical Haematology by JB Dacie
Clinical Diagnosis &Management by Laboratory methods (20th edition) by John Bernard Henary
Atlas of Haematology (5th edition) by G.A. McDonald

De Gruchy's clinical Haematology in medical practice
Text Book of Haematology by Tejendra singh

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Cytopathology & Cytotechniques

Rationale: The students will learn about various staining procedures for demonstration of different substances & various cytological investigations. This will include special staining procedures &handling & testing of various cytological specimens.

Unit-I

Introduction, Definition , Branches of Cytopathology.

Aspiration cytology- Principles, indications and utility of the technique with special emphasis on role of cytotechnician in FNAC clinics , Equipments used in FNAC clinics.

Exfoliative Cytology- Principles, indications and utility of the technique, Sample collection, labelling, preparation, processing of cervical, endometrial, respiratory tract, gastro intestinal tract and urinary tract sample , Smear preparation.

Unit-II

Fixatives and fixations :- types, uses, merits, demerits. Cell Block preparation.
Routine staining with MGG :- Stains preparation, staining method, Mounting , Pap staining.

Unit-III

Cryostat sectioning, its applications in diagnostic cytopathology.
Enzyme Cytochemistry: Diagnostic applications Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases , Vital staining for Sex Chromatin.

Unit-IV

Cervical cytology :- Identification of normal cells, malignant cells, inflammatory cells. Assessment of staining quality, problems and remedies.
Fluid cytology :- Assessment of smearing and staining quality, remedies, identification of , normal, neoplastic and inflammatory cells.
Special stains used in cytology:- PAS, Alcian Blue, Mucicarmin, Giemsa, Sudan.

Suggested Readings

Handbook of Histopathological Techniques by C F A Culling
Medical Lab technology by Lynch

An Introduction to Medical Lab Technology by F J Baker and Silverton
Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

Diagnostic Cytology by Koss Volume -II

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Basic Preventive Medicine and Community Health Care

Rational: This curriculum impart the knowledge of various types of diseases and functioning of various programmes.

Unit- I

Definition and concepts of health, important public health acts, health problems of developed and developing countries, environment and health.

Definition and concepts of epidemiology, diseases, types and use of epidemiology. Basic emergency care and first aid.

Unit-II

Epidemiology, etiology, pathogenesis and control of communicable disease like malaria, cholera, tuberculosis, leprosy, diarrhoea, poliomyelitis, viral hepatitis, measles, dengue, rabies, AIDS.

Unit-III

National Health Policy and Programs, DOTS, National AIDS control programme, National cancer control programme, universal immunization programme etc.

Nutrition and major nutritional problems, etiology, manifestations and prevention, components of RCH care. Examination of water, food adulteration, role of regular exercise and yoga in prevention and management of various diseases.

Unit-IV

Population, problems of population growth, birth rates, death rates, fertility rates, MMR.,CPR, Approaches and methods of contraception, Reproductive and child health. Hygiene and sanitation, sanitation barriers, excreta disposal.

Unit-V

Immunization programme, various national immunization programs and vaccine schedules, Family welfare and planning, communicable and non-communicable disease,

Health planning in India including various committees, national health policy and health goals. Objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA, FAO, ILO

Suggested Readings:

1. K.Parks & Sunder Lal, (2015),Textbook of Preventive Social Medicine ,3rd edition, Bhanot Publications
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publication

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Practical

Applied Clinical Biochemistry –II

1. Estimation of Glucose tolerance test (GTT).
2. Estimation of Insulin tolerance test (ITT).
3. Determination of Uric acid in Urine.
4. Determination of Creatinine clearance.
5. Determination of Urea clearance.
6. Determination of Serum acid phosphatase.
7. Determination of Serum Alkaline phosphatase.
8. Determination of Serum Lactate dehydrogenase.

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Applied Bacteriology

1. Processing of following clinical samples for culture and identification of bacterial pathogens:

Blood, Throat swab, Sputum, Pus, Urine

2. Stool for Salmonella, Shigella and Vibrio cholerae

3. C.S.F. and other body fluids

4. Demonstration of PCR

5. Demonstration of automation in bacterial culture detection and antimicrobial susceptibility testing

6. Antimicrobial susceptibility testing -
Preparation and standardization of inoculums ,To determine MIC and MBC of known bacteria against a known antibiotic ,To perform antibiotic susceptibility testing of clinical isolates by using

7. Collection, transportation and processing of following articles for bacteriological examination:

Water, Milk, Food andAir.

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Medical Parasitology & Entomology

1. Routine stool examination for detection of intestinal parasites with concentration methods: Saline preparation , Iodine preparation, Floatation method, Centrifugation method, Formal ether method, Zinc sulphate method

2. Identification of adult worms from models/slides:

Tapeworm, Tapeworm segments, Ascaris (Round worm), Hookworms, Pinworms

3. Malarial parasite:

Preparation of thin and thick smears, Staining of smear, Examination of smears for malarial parasites (P. vivax and P. falciparum)

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Basics of Haematological Diseases –II

1. Screening for sickle cell anemia.
2. Determination of fetal hemoglobin (HBF%).
3. Determination of osmotic fragility of RBC.
4. Sickling test.
5. Determination of glucose 6- Phosphate dehydrogenase (G-6-PD).
6. Determination of iron & total iron binding capacity (TIBC).
7. Detection of iron in the prepared smear. Determination serum haptoglobin.
8. Detection of hemosidrin in urine.
9. Physical, chemical & microscopic examination of C.S.F
10. Physical , chemical & microscopic examination of various fluids.
11. Screening for sickle cell anemia.
12. Determination of fetal hemoglobin (HBF%).
13. Determination of osmotic fragility of RBC.
14. Sickling test.
15. Determination of glucose 6- Phosphate dehydrogenase (G-6-PD).
16. Determination of iron & total iron binding capacity (TIBC).
17. Detection of iron in the prepared smear.
18. Determination serum haptoglobin.
19. Detection of hemosidrin in urine.
20. Physical, chemical & microscopic examination of C.S.F
21. Physical , chemical & microscopic examination of Seminal fluids.

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Cytopathology & Cytotechniques

1. To perform Papnicolaou's stain on cervical smear.
2. To perform Guard's staining for demonstration sex chromatin (Barr bodies on a buccal smear).
3. To perform Shorr's staining for Hormonal assessment.
4. To cut frozen sections of Gynaec tissue.
5. To perform CSF sample and body fluids by cytospin.
6. Should know the various stains used in Cytology lab:I May Grunwald Giemsa, H&E, PAS, Grocott's.

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(B.Sc. MLT)-Fifth Semester
SYLLABUS

Subject's Name

1. Analytical Biochemistry
2. Immunology & Bacterial Serology
3. Principle of Laboratory Management
4. Blood Banking & Genetics
5. Applied Histopathology-I

Subsidiary Subject-

1. Research Methodology & Biostatistics

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Analytical Clinical Biochemistry

Rationale: The students will learn basic principles/mechanisms, procedures and various types of techniques commonly performed in analytical biochemistry such as:

Unit- I

Spectrophotometry and colorimetry

Introduction, Theory of spectrophotometry and colorimetry, Lambert`s law and Beer`s law, Applications of colorimetry and spectrophotometry.

Unit- II

Photometry

Introduction , General principles of flame photometry, Limitations of flame photometry, Instrumentation , Applications of flame photometry , Atomic absorption spectroscopy – Principle & applications.

Unit- III

Chromatography

Introduction, Types of Chromatography.

Paper Chromatography: Introduction, principle, types, details for qualitative and quantitative analysis, application .

Thin layer chromatography: Introduction, experimental techniques, application of TLC, limitations, High performance thin layer chromatography.

Column chromatography: Introduction, principle column efficiency, application of column chromatography.

Gas chromatography: Introduction principle, instrumentation, application.

Ion exchange chromatography: Introduction, Definition and principle, cation and anion exchangers, application.

Gel Chromatography: Introduction Principle and method, application and advantages.

Unit- IV

Electrophoresis:

Introduction , Principle , Instrumentation , Applications , Types of electrophoresis, Paper electrophoresis, Gel electrophoresis.

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Suggested readings

Practical Clinical Biochemistry by Harold Varley
Text book of Medical Laboratory Technology by P. B. Godker

Medical Laboratory Technology by Mukherjee
Principal of Biochemistry by M. A. Siddiqi

Instrumental Analysis by Chatwal Anand
Text book of Medical Biochemistry by Chatterjee, Shinde

Principal of Biochemistry by Lehninger
Biochemistry by Voet&Voet

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Immunology & Bacterial Serology

Rationale: This section will cover the basic aspects of immunity, antigens, antibodies, various serological reactions, techniques and their utility in laboratory diagnosis of human diseases. It will also cover medically important fungi, infections caused by them and their laboratory diagnosis.

Unit- I

History and introduction to immunology

Immunity- Innate, Acquired immunity, Basic concepts about their mechanisms

Definition, types of antigens and determinants of antigenicity.
Definition, types, structure and properties of immunoglobulin.
Antigen-Antibody reactions- Definition, Classification, General features and mechanisms
Applications of various antigen antibody reactions.

Unit- II

Principle, procedure and applications of under mentioned in Medical Microbiology- Complement fixation test, Immuno- fluorescence, ELISA, SDS-PAGE, Western blotting.

Unit- III

Principle, procedure and interpretation of various serological tests-
Widal, VDRL, ASO, CRP, Brucella tube agglutination, Rose-Waaler.

Complement system- Definition, Basic concepts about its components, Complement activation pathways.

Unit- IV

Immune response- Introduction, Basic concepts of Humoral and Cellular immune responses.

Hypersensitivity- Definition, Types of hypersensitivity reactions.

Basic concepts of autoimmunity and brief knowledge about autoimmune diseases
Automation in diagnostic serology.

Unit- V

Vaccines- Definition, Types, Vaccination schedule, Brief knowledge about _Extended programme of immunization' (EPI) in India

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Suggested Readings:

Practical Medical Microbiology by Mackie & McCartney Volume 1 and 2

Text book of Microbiology by Ananthanarayanan
Medical Microbiology by Paniker& Satish Gupte

Medical laboratory Technology Vol. I ,II, III by Mukherjee
Medical Laboratory manual for tropical countries Vol II Microbiology by Monica Cheesbrough
Immunology by Riot

Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites

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Principle of Laboratory Management

Rationale: The students will be made aware of the basic ethics, good lab practices including awareness/ safety in a clinical lab. In addition they will understand sample accountability, quality management system, biomedical waste management, calibration and validation of clinical laboratory instruments, Laboratory Information system (LIS), Hospital Information system (HIS) and financial management.

Unit-I

Ethical Principles and standards for a clinical laboratory professional - Duty to the patient, Duty to colleagues and other professionals, Duty to the society.
Good Laboratory Practice (GLP) Regulations and Accreditation- Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation.

Unit-II

Patient management for clinical samples collection, transportation and preservation
Sample accountability- Purpose of accountability, Methods of accountability.

Sample analysis- Introduction, Factors affecting sample analysis, Reporting results, Basic format of a test report, Reported reference range, Clinical Alerts, Abnormal results, Turnaround time, Results from referral laboratories, Release of examination results, Alteration in reports.

Unit-III

Quality Management system- Introduction , Quality assurance, Quality control system, Internal and External quality control, Biomedical waste management in a clinical laboratory.
Introduction and importance of calibration and Validation of Clinical Laboratory instruments.

Laboratory Information system (LIS), Hospital Information system (HIS) and financial Management-

Introduction, Functions of a laboratory management system, Standards for laboratory management system.

Introduction and awareness of financial management in a clinical laboratory- Ethics in Medical laboratory Practice, Understanding the term _Ethics.

Ethics in relation to the following- Pre-Examination procedures, Examination procedures, Reporting of results, Preserving medical records, Access to Medical laboratory Records.

Unit-IV

Procurement of equipment and Inventory Control- Audit in a Medical Laboratory, Introduction and Importance, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation.

Suggested readings:

Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thaku

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Blood Banking & Genetics

Rationale: Blood banking will make students learn about blood grouping &blood, Transfusion. The students will learn about the concept of blood grouping, compatibility testing in blood transfusion &screening of donated blood for various Infection Diseases. Genetics will make students learn about Fundamentals of Heredity. The students will learn about the concept of inheritance in various genetic diseases.

Unit- I

History and discovery of blood group system, ABO and Rhesus blood group system, Cell and serum grouping, various methods, interpretation of results.
Discrepancies in blood grouping and resolving problems, Variants of D antigen and weak D typing.

Compatibility testing :- definition, indication methods.
Coombs test :- Direct, indirect, principle, procedure, interpretation, applications.

Unit- II

Blood component: Preparation, labeling, storage, cell separator, Preparation of packed cells and various fractions of blood for transfusion purposes.

Total quality management, documentation record keeping.

Transfusion reactions- Laboratory investigation of transfusion reactions and mismatched, transfusion reactions.

Compatibility tests in blood transfusion, complications and hazard of blood transfusion.

Transfusion transmissible diseases, screening methods (Sample collection, processing , handling and disposal).

Unit- III

Genetics- Continuity of life-heredity, variation, Mendel's laws of inheritance, Chromosomal basis of inheritance; other patterns of inheritance- incomplete dominance, multi parallelism, quantitative inheritance.

Unit- IV

Chromosomes - Bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination.

Molecular genetics: DNA as a genetic material- its structure and replication; structure of RNA and its role in protein synthesis, Vectors, plasmids, Human Genetics, Microbial genetics.

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Suggested readings

Practical Haematology by J.B. Dacie

Transfusion Science by Overfield, Hamer
Medical Laboratory Technology by K.L. Mukherjee Volume-I

Mollison's Blood Transfusion in Clinical Medicine, 12th Edition by Harvey G. Klein
Genes by Benjamin Lewin

Genetics by B.D. Singh
Principals of Genetics by Gardner
Instant Noteson Genetics by PC Winter, GI Hickey and HL Fletcher

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Applied Histopathology- I

Rationale: Inthissection,studentswillbemadeawareofterminologyusedin,histotechnology,various,

Instruments and their maintenance and also learn the processing of various samples for histopathological investigations.

Unit- I

Introduction to Histotechnology.
Compound microscope- Optical system, magnification and maintenance, Working principle
Applications of various types of microscopes i.e. dark field, polarizing, phase contrast, interference and fluorescent microscope.

General principles of Histopathology, collection of specimen, labeling, laboratory hazards, safety measures.
Equipments and glasswares used in histopathology working principles, merits, demerits, maintenance.

Unit- II

Fixation and fixatives- Fixation for special techniques, fixation of individual tissue.
Tissue processing : - Principles, dehydration, clearing and clearing agents, paraffin wax embedding, alternative embedding media, manual tissue processing, automatic tissue processing.

Unit- III

Microtomy :- Types of microtomes, microtome knives, Paraffin section cutting , Sectioning, faults remedies.
Tissue Requiring special treatment i.e. eye ball , Bone marrow biopsy, under calcified bones.
SI units- Molar solutions & buffers used in histoTechniques.
Dye chemistry :- Theory of staining, preparation of dyes, effects of impurities, problems remedies.

Unit- IV

Hematoxylin and eosin stain and staining.
Mounting and mounting media :- types composition, Procedures merits and demerits.
Museum techniques :- Preparation of specimen, storage, Mounting, maintenance, Record Keeping.

Suggested Readings

Handbook of Histopathological Techniques by C F A Culling
Medical Lab technology by Lynch

An Introduction to Medical Lab Technology by F J Baker and Silverton
Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

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Research Methodology & Biostatistics

Rationale: The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings. The students will also be made aware of the need of biostatistics and understanding of data, sampling methods, in addition to being given information about the relation between data and variables.

Unit-I

Research Methodology: Introduction to research methods , Identifying research problem.

Ethical issues in research- Research design, Basic Concepts of Biostatistics.

Unit-II

Types of Data- Research tools and Data collection methods, Sampling methods, Developing a research proposal

Unit-III

Biostatistics: Need of biostatistics, What is biostatistics: beyond definition, Understanding of data in biostatistics, How & where to get relevant data, Relation between data & variables

Type of variables: defining data set, Collection of relevant data: sampling methods.

Unit-IV

Construction of study: population, sample, normality and its beyond (not design of study, perhaps) , Summarizing data on the pretext of underlined study.
Understanding of statistical analysis (not methods)

Suggested readings

Statistical Methods by S.P. Gupta
Methods in biostatistics for medical students by B.K.Mahajan
RPG Biostatistics by HimanshuTyagi

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Practical

Analytical Clinical Biochemistry

1. To demonstrate the principle, working & maintenance of spectrophotometer.
2. To demonstrate the principle, working & maintenance of colorimeter.
3. To demonstrate the principle, working & maintenance of flame photometer.
4. To demonstrate the principle, procedure of paper chromatography.
5. To demonstrate the principle & procedure of Gas chromatography.
6. To demonstrate the principle & demonstration of TLC.
7. To demonstrate the principle & procedure of column chromatography.
8. To demonstrate the principle & procedure of Electrophoresis.

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Immunology & Bacterial Serology

1. Preparation of Phosphate buffers, Verinol buffer, ASO buffer, Richardson's buffer, Buffers of different pH and Molarity, Tris buffer.
2. Standardization of cell concentration by Spectrophotometer.
3. Performance of Serological tests i.e.

   Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation).
4. ASO (Anti-Streptolysin _O')
5. C-Reactive Protein (Latex agglutination)
6. Rheumatoid factor (RF) Latex agglutination
7. Rose Waaler test,
8. Demonstration of antigen/antibody determination by Immuno fluorescence (IF), Immunodiffusion, precipitation in Agarose gel (Ouchterlony), CCIEP, ELISA, SDS - PAGE and Western blotting.

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Principle of Laboratory Management

1. Clinical sample collection e.g. Blood, Urine, Stool, Saliva, Sputum .
2. Sample accountability- Labeling of sample, Making entries in Laboratory records.
3. Reporting results- Basic format of a test report, Release of examination results, Alteration in reports.
4. Quality Management system- Quality assurance, Internal and External quality control, Quality improvement.
5. Biomedical waste management in a clinical laboratory - Disposal of used samples, reagents and other biomedical waste.
6. Calibration and Validation of Clinical Laboratory instruments.
7. Ethics in medical laboratory practice in relation to the following-
   Pre-Examination procedures, Examination procedures, Reporting of results, Preserving medical records, Access to medical laboratory records

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Blood Banking & Genetics

1. Screening of blood donor: physical examination including medical history of the donor.
2. Collection and preservation of blood for transfusion purpose.
3. Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV.
4. To determine the ABO & Rh grouping-Direct or preliminary grouping, Indirect or proof grouping
5. Rh grouping and determination of Du in case of Rh negative.
6. To perform Direct and Indirect Coomb's test
7. To perform cross matching - Major cross matching, Minor cross matching
8. Preparation of various fractions of blood.

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Applied Histopathology-I

1. Preparation of 70% (V/V) alcohol (200ml) frame commercial available Ethylalcohol.
2. Gross examination and fixation of the specimen.
3. Processing of tissue by manual method.
4. Tissue processing by using an automatic tissue processor.
5. Sharpening of the microtome knife.
6. Section cutting of paraffin wax embedding, fixation.
7. H+E Staining.
8. Mounting procedure.

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(B.Sc. MLT)-Sixth Semester
SYLLABUS

Subject's Name

1. Clinical Endocrinology & Toxicology
2. Medical Mycology & Clinical Virology
3. Immunopathology & Moleculay Biology
4. Applied Haematology
5. Applied Histopathology-II

Subsidiary Subject-

1. Environmental Sciences

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Clinical Endocrinology & Toxicology

Rationale: This paper is framed to provide basic knowledge of hormones & toxic substances with their determination techniques as well as related disorders.

Unit-I

Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action.

Unit-II

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T_3, T_4, TSH, FT_3, FT_4, TBG, Disorder associated with thyroid dysfunction.

Unit-III

Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17-Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test.

Unit-IV

Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion.

Unit-V

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

Suggested readings:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7th edition, WileyPublications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier
4. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
5. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
6. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
7. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman

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Medical Mycology & Clinical Virology

Rationale: The student will be taught about introduction, general characteristics, life cycle and laboratory diagnosis of various Medically important Fungi and Viruses.

Virology:

Unit-I

Introduction to medical virology, Introduction to medically important viruses.
Structure and Classification of viruses.
Multiplication of viruses.

Unit-II

Collection, transportation and storage of sample for viral diagnosis.
Staining techniques used in Virology
Processing of samples for viral culture (Egg inoculation and tissue culture).

Unit-III

Rapid diagnosis of viral infections with special reference to HIV, HBV and HCV

EIA, Immunofluorescence, PCR

Mycology:

Unit-I

Introduction to Medical Mycology Basic concepts about superficial and deep Mycoses
Taxonomy and classification and general characteristics of various medically important fungi
Normal fungal flora.

Unit-II

Morphological, cultural characteristics of common fungal laboratory contaminants
Culture media used in mycology.
Direct microscopy in Medical mycology laboratory, Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids.
Techniques used for isolation and identification of medically important fungi.

Unit-III

Methods for identification of yeasts and moulds, Dimorphism in fungi, Antifungal susceptibility tests.
Preservation of fungal cultures, Routine myco-serological tests and skin tests.

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Suggested Readings

Practical Medical Microbiology by Mackie &MacCartney Volume 1 and 2
Text book of Microbiology by Ananthanarayanan

Medical Microbiology by Panikar& Satish Gupte
Medical laboratory Technology Vol. I ,II, III by Mukherjee

Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough

Medical Mycology by Dr. JagdishChander

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Immunopathology & Molecular Biology

Rationale: The students will learn how to analyze various clinical patients' samples, for estimation of different components which are the cause of the immune disease or are the diagnostic/prognostic markers. This subject gives information about various clinically important cells of immune system, lymphoid organs, antigen, antibody, Ag-Ab. reactions, transplant immunology etc. & automation techniques. Molecular biology concerns the molecular basis of biological activity between biomolecules in the various systems of a cell, including the interactions between DNA, RNA and proteins and their biosynthesis, as well as the regulation of these interactions. A basic introduction of molecular biology and its techniques like PCR, RTPCR etc. will also be rendered to sensitize students to take up future molecular biology challenges.

Unit-I

Introduction to Immunology, Cells of the immune system, Types and Mechanisms of immune response.

Lymphoid organs of the Immune system, MHC I & II

Unit-II

HLA Typing & Cross matching, Transplant Immunology.

Hypersensitivity: Definition, Types, Mechanisms, Autoimmunity
Immune tolerance : Basic concepts.

Unit-III

Introduction to Molecular Biology, Relationship of Mol. Biology with other Science.
Molecular Biology Techniques : Principle, Reagents used, procedure and applications in Medical diagnostics.
Polymerase Chain Reaction and its advanced versions, Gel electrophoresis, Western blot.

Unit-IV

Chemical composition of DNA , DNA replication.
DNA damage and repair.

Regulation of prokaryotic and eukaryotic gene expression, Cell Cycle.

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Suggested Readings

Immunology by Ivan Roitt, JonathaanBrostoff and David Male
Immunology by Kuby

Medical Immunology by Daniel P Stites
Basic & Clinical Immunology by P. Daniel Fudenberg. H. Hugh and Stites

Elements of Biotechnology by PK Gupta
Watson Molecular Biology of Gene

Advanced Molecular Biology by R Twyman
Principal of Biochemistry by Lehninger

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Applied Haematology

Rationale: The students will be made aware of Infection, Inflammation, different anemia, Leukemia, chromosomal studies, bleeding disorders and radiation hazards.

Unit-I

Infections- Definition, Components, Types, Pathogenesis.

Inflammation- Introduction, Definition, Sign, Types.

Acute inflammation, Chronic inflammation, mechanism, sign, inflammatory cells, symptoms.

Unit-II

Laboratory investigations of iron deficiency anaemia., Laboratory investigations of megaloblastic anaemia.

Classification, causes and laboratory investigations of hemolytic anaemias.

Unit-III

Bleeding and coagulation disorders and laboratory investigation of platelet disorders, coagulation disorders, disseminated intravascular coagulation.

Leukemia's pathogenesis, classification.

Cytochemical staining in haematology- (MPO,SUDON)

Cytogenectics in hematology.

Unit-IV

Seminal fluid analysis: Normal semen, production, composition, specimen handling and disposal of sample, physical examination, chemical and microscopic examination, sperm concentration techniques.

Chromosomal studies in various hematological disorders and their significance.

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Applied Histopathology-II

Rationale: In this section, students will be made aware of terminology used in ,histotechnology, various special stains used for identification of various tissues components for histopathological investigations.

Unit-I

Connective tissue: Stains and staining methods , properties, PTAH, Reticulin, verhoff, Masson trichrome,VenGiesson, Heidemhain's Aniline Blue Method
Mucin: Types, various stains and staining methods PAS, alcian blue, Mucicarmine.

Unit-II

Lipids: Types, identification with various stains and staining method (Sudan ,oil red O).
Pigments: Various pigments, identification with various stains methods and staining (hemosiderin melanin).
Miscellaneous (calcium)Vonkossa's Stains
Amyloid :-Toludineblue, Metachromatic Stains.

Unit-III

Identification of microorganisms using various stains: Modified Giemsa Stains, Silver Nitrate GMS.
Decalcification :- various decalcifying agents, properties, method, factors affecting rate of decalcification, advantages and disadvantages of each method, processing & staining.
Frozen section :- Equipments used, section cutting, staining.

Unit-IV

Immuno histochemical and immuno cytochemical staining, quality control.
nzyme, histochemistry, demonstrations of phosphates, dehydrogenases oxidises and peroxides etc.
Cancer Immunology, Immunofluorescence Introduction.

Suggested Readings

Handbook of Histopathological Techniques by C F A Culling
Medical Lab technology by Lynch

An Introduction to Medical Lab Technology by F J Baker and Silverton
Bancroft's Theory and Practice of Histopathological Techniques by John D Bancroft

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SUBSIDIARY SUBJECT

Environmental Sciences

Rationale: The student will be made aware of the environment in general, natural resources, ecosystems, environmental pollution, and social issues related to environment, human population and the environment and understanding the hospital environment.

Unit-I

Biotic and a biotic environment, Adverse effects of Environment Pollution, Control strategies.

Unit-II

Water Pollution: Water Quality standards for potable water, Impurities in water and their removal, Defluoridation, Self purification of streams.

Air pollution; Source of air contaminants, Adverse effects on human health, Measures to check air pollution, Greenhouse effect, Acid Rain, Ozone depletion.

Unit-III

Biomedical Waste Management: Introduction to Bio-medical waste , Types of bio-medical waste

Collection of bio-medical waste, Treatment and disposal of bio-medical waste

Solid waste Management: Introduction to solid waste, Its collection and disposal, Sanitary land-filling

Vermin-composting, Hazardous waste management.

Unit-IV

Land Pollution: Soil conservation, Land erosion.

Ecology: Busies of species, Biodiversity, Population dynamics, Energy flow, Ecosystems.

Suggested Readings

Agarwal, K. C. 2001 Environment Biology, Nidi Publ. Ltd. Bikaner.

Jadhav, H &Bhosale, V.M. 1995. Environment Protection and Laws. Himalaya Pub House, Delhi 284 p.

Rao M. N. &Datta A.K. 1987. Waste water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.

Daniel D. Chiras 2010. Environmental Science. 1st Indian Edition, Jones and Bartlett In 4262/3, Ansar Road, Daryaganj, New Delhi.

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Practical

Clinical Endocrinology & Toxicology

1. To determine T_3 conc. in serum sample.
2. To determine T_4 conc. in serum sample.
3. To determine TSH conc. in serum sample.
4. To determine LH conc. in serum sample.
5. To determine FSH conc. in serum sample.
6. To determine Prolactin conc. in serum sample.
7. To perform TRIPLE test.
8. Demonstration of male and female infertility test.
9. Beta HCG

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Medical Mycology & Clinical Virology

1. To prepare culture media used routinely in mycology.

2. To perform KOH preparation, Gram stain, Potassium Hydroxide - Calcofluor White method, IndiaInk preparation, Modified Kinyoun Acid Fast Stain for Nocardia, LCB preparation.

3. To identify given yeast culture by performing various identification techniques studied in theory.
4. To identify given mould culture by performing various identification techniques studied in theory.
5. To demonstrate dimorphism in fungi.

6. To collect and process clinical samples for laboratory diagnosis of fungal infections i.e. Skin, Nail, Hair, Body fluids and secretions.

7. To demonstrate structure of viruses and their multiplication from charts etc.

8. To perform Giemsa stain, Seller's stain, immunofluorescent staining procedures for diagnosis of viral infections.

9. Demonstration of fertilized hen egg
10. Demonstration of various inoculation routes in fertilized hen egg

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Immunopathology & Molecular Biology

1. Peripheral blood mononuclear cell (PBMC) isolation by gradient centrifugation.
2. T and B cell separation.
3. Immunofluorescence.
4. Anti- Nuclear Antibody (ANA).
5. Anti- Neutrophil Cytoplasmic Antibody (ANCA).
6. Gel diffusion, Nephlometery.
7. Nitro blue Tetrazolium Chloride Test (NBT).
8. Western blotting, Isolation of DNA and RNA.
9. Estimation of DNA and RNA.
10. Determination of molecular weight and quantification of DNA using agarose gel electrophoresis

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Applied Haematology

1. Laboratory tests in iron deficiency anaemia.
2. Laboratory test for diagnosis of Megaloblastic anaemia.
3. Laboratory test for diagnosis of Leukemia.
4. Cytochemical staining, MPO, SUDAN BLACK B.
5. Laboratory test for diagnosis of hemolytic anaemia.
6. Laboratory test for bleeding disorders.
7. Laboratory test for Coagulation disorders.
8. Laboratory test for Platelates disorders.
9. Semen examination (Physical, chemical, microscopic).

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Applied Histopathology -II

1. Decalcification of the calcified tissue.
2. Staining of the section by Reticulin silver nitrate method.
3. Staining of the section for elastic fibers.
4. Staining and identification of the various types of mucin..
5. Staining and identification of Amylioids
6. Staining of the section for hemosiderin, melanin, calcium.
7. Gram staining for bacteria.
8. Acid fast staining for bacteria.
9. Weak acid fast staining.
10. Section cutting & staining for frozen section .

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