OPJS UNIVERSITY, CHURU (RAJASTHAN)

SYLLABUS

For

B.Sc. in

Medical Laboratory Technology

B.Sc.- (MLT)

(Academic Program)

*

School of Para-Medical Science

OPJS UNIVERSITY, CHURU (RAJASTHAN)

2014-15

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### SCHEME OF EXAMINATIONS

**B.Sc.-(MLT)**

(First Year)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Name of Papers</th>
<th>M.M.(T./S./P.)</th>
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<tbody>
<tr>
<td>1.</td>
<td>BSMLT-101</td>
<td>General Pathology &amp; General Microbiology</td>
<td>50+50</td>
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<tr>
<td>2.</td>
<td>BSMLT-102</td>
<td>Hematology</td>
<td>50+50</td>
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<td>3.</td>
<td>BSMLT-103</td>
<td>Fundamentals of Anatomy &amp; Physiology</td>
<td>50+50</td>
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<td>4.</td>
<td>BSMLT-104</td>
<td>Basics of Biochemistry, Clinical Pathology, Instruments &amp; Reagents</td>
<td>50+50</td>
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<td>*------------</td>
<td>English &amp; Computer</td>
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*Not included for university examination.

(Second Year)

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<td>BSMLT-201</td>
<td>Blood Bank Procedures &amp; Hemoglobinopathies</td>
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<td>2.</td>
<td>BSMLT-202</td>
<td>Endocrinology, Tumor &amp; Cancer Markers</td>
<td>50+50</td>
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<td>BSMLT-203</td>
<td>Clinical Biochemistry</td>
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<td>4.</td>
<td>BSMLT-204</td>
<td>Immunology, Serology &amp; Parasitology</td>
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(Third Year)

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<td>BSMLT-202</td>
<td>Coagulation studies</td>
<td>50+50</td>
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<td>3.</td>
<td>BSMLT-203</td>
<td>Systemic bacteriology, Mycology &amp; Virology</td>
<td>50+50</td>
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<td>4.</td>
<td>BSMLT-204</td>
<td>Quality Laboratory Management &amp; Automation</td>
<td>50+50</td>
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Details of Syllabus
(First Year)

BSMLT-101- GENERAL PATHOLOGY & GENERAL MICROBIOLOGY

THEORY

GENERAL PATHOLOGY
   (a) Normal Cell
   (b) Cell Injury- types of cell injury, etiology of cell injury, morphology of cell injury, cellular swelling.
   (c) Cell death : types- autolysis, necrosis, apoptosis & gangrene.
   (d) Cellular adaptations-atrophy, hypertrophy, hyperplasia & dysplasia.
2. Inflammation
   (a) Acute inflammation - vascular event, cellular event, inflammatory cells.
   (b) Chronic Inflammation - general features, granulomatous inflammation, tuberculoma.
3. Haemodynamic Disorders :
   Oedema, hyperemia, congestion, haemorrhage, circulatory disturbances, thrombosis, ischaemia & infarction.
4. Neoplasia :
   Definition, how does it differ from hyperplasia, difference between benign tumor and malignant tumor.
5. Healing
   Definition, different phases of healing, factors influencing wound healing.

GENERAL MICROBIOLOGY
1. General characters and classification of Bacteria.
2. Characteristics of Bacteria
   Morphology - Shape, Capsule, Flagella, Inclusion, Granule, Spore.
3. Growth and Maintenance of Microbes
   Bacterial division, Batch Culture, Continuous culture, bacterial growth- total count, viable count, bacterial nutrition, oxygen requirement, CO2 requirement, temperature, pH, light.
4. Sterilization and Disinfection.
   Physical agents- Sunlight, Temperature less than 1000C, Temperature at 1000C, steam at atmospheric pressure and steam under pressure, irradiation, filtration.
   Chemical Agents- Alcohol, aldehyde, Dyes, Halogens, Phenols, Ethylene oxide.
5. **Culture Media**
 Definition, uses, basic requirements, classification, Agar, Peptone, Transport Media, Sugar Media, Anaerobic Media, Containers of Media, Forms of Media

6. **Staining Methods**
 Simple, Grams staining, Ziehl-Neelsen staining or AFB staining, Negative Impregnation

7. **Collection and Transportation of Specimen**
 General Principles, Containers, Rejection, Samples- Urine, Faeces, Sputum, Pus, Body fluids, Swab, Blood.

8. **Care and Handling of Laboratory Animals**
 Fluid, Diet, Cleanliness, Cages, ventilation, Temperature, Humidity, handling of Animals, Prevention of disease.

9. **Disposal of Laboratory/Hospital Waste**
 Non-infectious waste, Infected sharp waste disposal, infected non-sharp waste disposal.

### PRACTICAL

**GENERAL PATHOLOGY**
1. Components & setting of the Compound microscope.
2. Focusing of object.
3. Use of low & high power objectives of microscope.
4. Use of oil immersion lens.
5. Care and Maintenance of the microscope.
6. Different types microscopy
   - Dark field microscopy
   - Fluorescence Microscopy

**GENERAL MICROBIOLOGY**
1. Preparation of swabs/sterile tubes & bottles.
2. Preparation of smear.
4. Identification of Culture media.
5. Identification of instruments.
6. Identification of common microbes.

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**BSMLT-102- HEMATOLOGY**

### THEORY

1. **Hematological Disorders**
b. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
c. Megaloblastic Anemia: Causes, Lab findings.
d. Hemolytic Anemia: Definition, causes, classification & lab findings.
e. Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow - Periodic Acid Schiff, Sudan Black, Myeloperoxidase.
f. Leukemia: Classification, Blood Picture, Differentiation of Blast Cells

2. Basic Hematological Techniques
a. Characteristics of good technician
b. Preparation of specimen collection material.
c. Lab. request form.
d. Basic steps for drawing a blood specimen by veinipuncture. Complications of veinipuncture.
e. Patient after care
f. Specimen rejection criteria for blood specimen
g. Hemolysis of blood
h. Blood collection by skin puncture (Capillary Blood)
i. Arterial puncture.
j. Deciding specimen types and selection of - o Anticoagulant- EDTA, Citrate, Oxalate, Heparin, sodium fluoride.
k. Separation of serum
l. Separation of plasma
m. Changes in blood on keeping
n. Maintenance of specimen identification
o. Transport of the specimen.
p. Effect of storage on Blood Cell Morphology
q. Universal precautions

PRACTICAL
1. Basic requirements for hematology laboratory.
2. Glasswares for Hematology.
3. Equipments for Hematology.
7. TRBC Count by Hemocytometers.
8. TLC by Hemocytometer.
10. Determination of Platelet Count.
11. Determination of ESR by wintrobes.
14. Erythrocyte Indices- MCV, MCH, MCHC.
15. Reticulocyte Count.

Suggested Readings:
1. Practical Pathology P. Chakraborty Gargi Chakraborty New Central Book Agency, Kolkotta
2. Text Book of Haematology Dr. Tejinder Singh Arya Publications, Sirmour (H.P)
3. Text Book of Medical Laboratory Technology Praful Godkar Bhalani Publication House, Mumbai
5. Todd & Sanford, Clinical Diagnosis & Management by Laboratory Methods John Bernard Henry All India traveller Booksellar, Delhi.

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BSMLT-103- FUNDAMENTALS OF ANATOMY & PHYSIOLOGY

THEORY

ANATOMY :
1. General Anatomy
   a. Cell - structure & function
   b. Tissue
      - Epithelium
      - Connective
      - Sclerous
      - Muscular
      - Nervous
   c. Lymphatic System
2. Systemic
   Basic Features of :
   a. Cardiovascular system
   b. Respiratory system
   c. Digestive system
   d. Excreitory system
e. Genital (Male & Female) system
f. Nervous system

**PHYSIOLOGY**

1. **Cell** : Structure & function

2. **Blood**
   a. Blood cells
   b. Haemoglobin
   c. Blood groups
   d. Coagulation Factors
   e. Anaemia & Immunoglobulins

3. **Cardiovascular system**
   Heart rate, cardiac cycle, cardiac output, blood pressure, hypertension, radial pulse

4. **Respiratory System**
   a. Ventilation
   b. Functions
   c. Lungs Volumes and capacities

5. **Gastrointestinal System**
   Process of digestion in various parts

6. **Endocrinology**
   a. List of Endocrine Glands
   b. Hormones : Their secretion and functions (in brief)

7. **Excretion system**
   a. Structure of nephron
   b. Urine formation

8. **Central Nervous System**
   a. Parts
   b. Sliding Filament Theory
   c. Neuro Muscular Junction
   d. Wallerian Degeneration
   e. Motor Nervous system
      - Upper motor neuron system
      - Lower motor neuron system
   f. Sensory nervous system
   g. Sympathetic Nervous system
   h. Parasympathetic nervous system

9. **Skin** - Function & Structure

10. **Muscular System**
    Classification of muscles & their functions

11. **Special Senses** - Eye & ear (in brief)
PRACTICAL

ANATOMY
1. Identification and description of all anatomical structures.
2. The learning of Anatomy is by demonstration only through dissected parts, slides, models, charts etc.
3. Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).
4. Demonstration of skeleton - articulated and disarticulated.

PHYSIOLOGY
1. Measurement of pulse, blood pressure.
2. Elicitation of Reflexes & jerks.
3. Identification of blood cells by study of peripheral blood smear.

Suggested Readings:
3. Text Book of Human Histology Inderbir Singh Jaypee Brothers, Medical Publishers, Delhi
4. Clinically Oriented Anatomy Keith L. Moore Williams and Wilkins, Baltimore
5. Gray’s Anatomy Susan Standring Elsevier Churchill Livingstone, Edinburg

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BSMLT-104- BASICS OF BIOCHEMISTRY, CLINICAL PATHOLOGY, INSTRUMENTS & REAGENTS

THEORY
1. Chemistry of carbohydrates & their related metabolism -
   Introduction, definition, classification, biomedical importance & properties.
   Brief outline of metabolism : Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.
3. Chemistry of Proteins & their related metabolism -
   Introduction, definition, classification, biomedical importance.
   Metabolism : Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine , Proteinuria.
4. Chemistry of Lipids & their related metabolism -
   Introduction, definition, classification, biomedical importance, essential fatty acids.
Brief out line of metabolism: Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

5. Enzymes -
Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

6. Acid base balance concepts & disorders - pH, Buffers, Acidosis, Alkalosis

7. Hyperglycemia & hypoglycemia -
Diabetes mellitus - definition, types, features, gestation diabetes mellitus, glucose tolerance test, glycosurias, Hypoglycemia & its causes

**PRACTICAL**

1- Introduction
   Aim, basis, interpretation, safety in clinical biochemistry Laboratory
2- Laboratory organisation
   Instruments, glassware, sample collection & specimen labeling, routine tests, anticoagulants, reagents, cleaning of glassware, isotonic solution, standardization of methods, preparation of solution & interpretation of result, normal values.
3- Identification of Carbohydrates (qualitative tests).
3- Identification of Proteins (qualitative tests).
4- To study general properties of the enzyme (Urease) & Achromatic time of Salivary amylase.
5- Urine analysis – normal & abnormal constituents of urine.
6- CSF & Semen Analysis - Gross & Microscopic.
7- Glucose tolerance test & Glycosylated haemoglobin.

8- Centrifugation: Principle, types & applications.

9- Chromatography: Definition, types, RF value, description of paper chromatography & applications.

10- Uses, Care and Maintenance of various instruments of the laboratory.

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(Not for university Examination)

Min. Hrs - Theory: 40 Hrs.

1. Introduction: Study techniques, Organisation of effective note taking and logical processes of analysis and synthesis, the use of the dictionary, enlargement of vocabulary & effective diction.
2. Applied Grammar: Correct usage, the structure of sentences, the structure of paragraphs.
3. Written Composition: Precise writing and summarising, writing of bibliography, enlargement of vocabulary.
4. Reading and comprehension Review of selected materials and express oneself in one's words, enlargement of vocabulary.
5. The study of various forms of composition paragraph, essay, letter, summary, practice in writing.

Suggested Readings:
1. V.R.Narayana, Sharma Strengthen your writing, New Delhi, Orient Longman
2. When and Martin – Grammer and composition, Delhi, Chand & Co.
3. Shashikumar V., D’Souza P.V, Spoken English, New Delhi, Tata Mergaw Hill
5. Nehpal Singh Tanwar-Learn English, Alwar Printers, Alwar(Rajasthan)

COMPUTER

(Not for university Examination)
Min. Hrs - Theory : 30 Hrs., Practical : 30 Hrs.
1. Basics of computer
2. Hardware and software
3. Operating system – DOS, etc
4. Internet- Email, social networking, application in medicine, browsing journals and article using internet.

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(Second Year)

BSMLT-201- BLOOD BANK PROCEDURES & HEMOGLOBINOPATHIES

THEORY

1. Blood Grouping
1. Introduction
2. Human Blood Group system
3. ABO Subgroups
4. Red Cell Antigen
5. Natural Antibodies
6. Rh System
7. Rh Antigens & Rh Antibodies
8. Hemolytic Disease of Newborn & Prevention
9. Principal of Blood grouping, antigen-antibody reaction.
10. Agglutination, Haemagglutination, Condition required for antigen antibody reaction.
13. group, Rh grouping by slide & tube method.
15. Rouleaux formation, how it interfere with Blood grouping.
16. Auto agglutinins.
17. Antiserum used in ABO test procedures, Anti-A, Anti-B Anti-AB Antiserum.
18. Inheritance of the Blood groups.
20. Medical applications of Blood groups.

2. Blood Transfusion
1. Principal & Practice of blood Transfusion.
2. Blood Transfusion service at District level.
5. Objectives of Quality Assurance in Blood Transfusion services, Standard
6. operating procedures for usage, donation & storage of blood, screening of donor,
7. compatibility testing, safety, procurement of supplies.

3. Blood Donation
1. Introduction
2. Blood donor requirements
3. Criteria for selection & rejection
4. Medical history & personal details
5. Self-exclusion.
6. Health checks before donating blood.
7. Screening for TTI.

4. Blood Collection
2. Anticoagulants.
3. Taking & giving sets in Blood transfusion.
4. Techniques of collecting blood from a doctor.
5. Instructions given to the donor after blood donation.
6. Adverse donor reaction.
5. Testing Donor Blood
1. Screening donor’s blood for infectious agents - HIV, HCV, HBV, Trepanoma
2. Palladium, Plasmodium, HTLV.

6. Blood Donor Records
2. Recording results.

7. Storage & Transport
1. Storage of blood.
2. Changes in blood after storage.
4. Lay out of a blood bank refrigerator
5. Transportation.

8. Maintenance of Blood Bank Records

9. Compatibility Testing
1. Purpose
2. Single tube compatibility techniques using AHG reagent.
3. Emergency compatibility testing.
4. Difficulties in cross matching.
5. Labeling & Issuing cross- matched blood.

10. Blood Components
1. Collection of blood components for fractional transfusion.
2. Platelets packed Red Cell, Platelet rich Plasma, Platelets concentrate.

11. Blood Transfusion Reactions
1. Investigation of a Transfusion reaction.
2. Hemolytic transfusion reaction.
3. Actions to take when transfusion reaction occurs.

PRACTICAL
1. Blood grouping & Cross Matching

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BSMLT-202- ENDOCRINOLOGY, TUMOR & CANCER MARKERS

THEORY
ENDOCRINOLOGY
1. Introduction
2. Difference between hormones and enzymes.
3. Classification of hormones.
4. Regulation and general mechanism of action of hormones.
5. Pituitary gland & hypothalamus
6. Hormones of the Anterior Pituitary - Growth hormone, Prolactin, Gonadotropin, Follicle Stimulating hormone, Leuteinizing Hormone, Thyroid stimulating hormone (TSH), Adrenocorticotropic hormone (ACTH)
7. Hormones of neurohypophysis - Oxytocin, Antidiuretic hormone (ADH)
8. Hormones of the Thyroid gland - chemistry and normal physiology, Thyroid disorders-goiter, myxodema, autoimmune thyroiditis, tumors of the thyroid gland, hyperthyroidism, Graves disease, Calcitonin, Parathyroid Hormone (PTH)
10. Adrenal medulla-metabolism of catecholamines
11. Hormones of the gonads - Testosterone, Estrogens, Progesterone, their synthesis and functions. Human Chorionic Gonadotropin (HCG), hormone, menstrual cycle, Menopause
13. Hormone of kidney – Renin

TUMOR & CANCER MARKERS:
1. Introduction.
2. The Carcinogens-definition.
3. Oncogene-definition-
   Mechanism of action of Oncogenes (outline).
4. Characteristics of growing tumor cells-general and morphological changes, biochemical changes.
5. Tumor Markers-
   Introduction and definition
7. Enzymes as tumor markers, Alkaline Phosphatase (ALP), Creatine kinase (CK), Lactate dehydrogenase (LDH), Prostatic acid phosphatase (PAP), Prostate specific antigens (PSA).
8. Hormones as tumor markers (introduction of each type in brief).
10. Alpha feto protein (AFP)
11. Carcino embryonic antigen (CEA)
13. Carbohydrate markers (brief introduction of each type)
   CA 15-3, CA 125
14. Blood group antigen (brief introduction of each type)
   CA 19-9, CA 50, CA 72-4, CA 242
15. Bladder cancer markers (introduction in brief) -
   Bladder tumor antigen (BTA)
16. Fibrin- Fibrinogen degradation product (FDP).
17. Nuclear matrix protein (NMP22).
18. Biomarkers still in research (introduction in brief)-
   Telomeres, TRAP assay, hyaluronic acid and Hyaluronidase

ENDOCRINOLOGY
1. Estimation of T3
2. Estimation of T4
3. Estimation of TSH
4. Estimation of FSH
5. Estimation of LH
6. Estimation of hCG
7. Estimation of Cortisol
8. Estimation of Progesterone
9. Estimation of Testosterone

TUMOR & CANCER MARKERS:
1. Estimation of Alpha fetoproteins (AFP)
2. Estimation of Carcino embryonic antigen (CEA)
3. Estimation of CA-125
4. Estimation of Prostate specific antigen (PSA)

OTHER ELISA TESTS
1. Test for HIV
2. Test for Hepatitis B (HBsAg)
3. Test for Hepatitis (HCV)
4. Malaria antigen
5. Tuberculosis-IgG/IgM

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BSMLT-203- CLINICAL BIOCHEMISTRY

THEORY
1- Photometry-
   Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer, types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.

2- Water & Mineral Metabolism-
   Distribution of fluids in the body, ECF & ICF, water metabolism, dehydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements.

3- Liver Functions & their Assessment-
   Based on: 1- Carbohydrate metabolism 2-Protein metabolism 3- Lipid metabolism
4- Measurements of serum enzyme levels 4-Bile pigment metabolism, Jaundice, its types and their biochemical findings.

4- Renal Function Tests-
   Various Tests, GFR & Clearance

5- Immunodiffusion Techniques, Radioimmunoassay & ELISAPrinciples & Applications.

6- Electrophoresis -
   Principle, Types & Applications.

7- Polymerase Chain Reaction -
   Principle & Applications

8- Autoanalysers -
   Principle & Applications

9- Vitamins-
   Fat & water soluble vitamins, sources, requirement, deficiency disorders & biochemical functions.

10- Cardiac Profile -
   In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases

11- Different methods of Glucose Estimation-
   Principle advantage and disadvantage of different methods

12- Different methods of Cholesterol Estimation -
   Principle, advantage and disadvantage of different methods.

**PRACTICAL**

*(By Colorimeter / Spectrophotometer)*

1. Blood urea estimation
2. Serum creatinine estimation
3. Serum uric acid estimation
4. Serum total protein estimation
5. Serum albumin estimation
6. Serum globulin estimation
7. Serum glucose estimation
8. Total cholesterol estimation
9. HDL cholesterol (direct) estimation.
10. LDL cholesterol (direct) estimation
11. Triglyceride estimation
12. Serum Bilirubin total estimation
13. Serum Bilirubin direct estimation
14. Serum amylase estimation
15. Serum GOT (AST) estimation
16. Serum GPT (ALT) estimation
17. Alkaline phostase estimation
18. Acid phosphatase estimation
19. Serum sodium estimation
20. Serum potassium estimation
21. Serum chloride estimation
22. CK-NAC estimation

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BSMLT-204- IMMUNOLOGY, SEROLOGY & PARASITOLOGY

THEORY

IMMUNOLOGY & SEROLOGY
1. Immunity - Definition and classification
   - General Principles of Innate & Acquired Immunity.
2. Immune Response - Humoral immunity & cell mediated immunity.
3. Antigen - Definition, classes, properties.
4. Antibodies/Immunoglobulins - Definition, Properties, Sub types of Immunoglublines
5. Antigen/Ab Reaction/Serological Refractions -
6. Features of antigen/antibody Reaction- 
   - Precipitation
   - Agglutination
   - Complement fixation test
   - Neutralization
   - Opsonization
   - Immune adherence
   - Immuno fluorescence
   - Immuno electron microscopic test
7. Structure and functions of Immune System
   - Parts of Immune system
- T/B cells, other cells & their functions
8. Hyper sensitivity Reactions
- General Principles of different types of hypersensitive reactions i.e., type 1, 2, 3, 4.
- Auto immune disorders
9. ELISA
10. Vaccination - Schedule & Vaccines

PARASITOLOGY
1. Definition - parasitism, HOST, Vectors etc.
2. Classification of Parasites .
3. Phylum Protozoa- general Pathogenic and non pathogenic protozoa.
5. Phylum Platyhelminths - class-Cestoda, class-Trematoda.

Protozoa :
  i. Intestinal Amoebae
   a. E. Histolytica : Life cycle, Morphology, Disease & Lab Diagnosis
   b. E. coli : Life cycle, Morphology, Disease & Lab Diagnosis
  ii. Flagellates of intestine/genitalia
   a. Giardia lamblia : Life cycle, Morphology, Disease & Lab Diagnosis
   b. Trichomonas vaginalis : Life cycle, Morphology, Disease & Lab Diagnosis
  iii. Malarial Parasite
   a. Plasmodium vivax : Life cycle, Morphology, disease & lab diagnosis
   b. Differences between P. vivax, P. malaria, P. falcipae & P.ovale.

Nematodes :
Intestinal Nematodes :
  a. Ascaris : Life cycle, Morphology, disease & lab diagnosis
  b. Brief discussion about Enterobius vermicularis (Thread worm ) and Ancylostoma duodenale (Hook worm)
Tissue Nematodes :
W. Bancrofti - Life cycle, Morphology, Disease & Lab Diagnosis
Phylum Platyhelminths
  a. Cestodes - T. solium, T. saginata & E. granulosus. (in brief)
  b. Trematodes - S. haematobium & F. hepatica (in brief)

IMMUNOLOGY & SEROLOGY
  1. WIDAL Test
  2. VDRL Test,
  3. RA Test
PARASITOLOGY
1. Stool examination.
2. Identification of different ova & cysts in stool samples.

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(Third Year)

BSMLT-301-HISTOPATHOLOGY & CYTOLOGY TECHNIQUES

THEORY
1. Introduction to Histopathology, expfoliative Cytology.
2. Basic steps for Tissue Processing - Fixing, Embedding, Microtomy, Staining, Mounting, methods of decalcifications.
3. Laboratory requirements for Histopathology & Cytology - Chemicals & Reagents
5. Staining Methods -
   b. Reticulin stain
   c. PAP staining - components & methods.
6. Museum Techniques
   a. The mounting of pathological specimens - Introduction, Preparation of specimen, Fixation of specimen - Kaiserling solution-1 & Kaiserling solution-2
   b. Precaution taken for the Fixation of Specimens.
   c. Storage of Specimens.
   d. Mounting of Museum Specimens.
   e. Routine Mounting of Specimens.
   f. Filling and Scaling.

PRACTICAL
1. Parts of microtome
2. Tissue processing
3. H&E staining
4. PAP staining.
BSMLT-302- COAGULATION STUDIES

THEORY
1. Hemostasis - Definition, Basic concept and principle, Basic steps involved in Hemostosis.
2. Coagulation -
   a. Basic Physiology, coagulation factors.
   b. Mechanism of blood coagulation.
   c. Extrinsic Pathway.
   d. Intrinsic Pathway.
   e. Regulators of blood coagulation.
3. Testing of blood coagulation -
   b. Clotting Time- Capillary tube method & Lee white's method.
   c. PT, aPTT, TT
   d. Clot retraction time
   e. Determination of fibrinogen.
4. Quality Assurance for routine Heamostasis Laboratory.
   Introduction.
   b. Sample collection technique (Phelbotony)
   c. Sample preparation, Anticoagulant used, Importance of use of Sodium Citrate.
5. Role in Diseases, Bleeding disorders.
   Platelet disorder - Thrombocytopenias - causes including aplastic anemia.
   a. D I C
   b. I T P
   c. Hemophilia

PRACTICAL
1. Precautions to prevent hemolysis
2. Storage of blood specimens
3. Bleeding time & clotting time estimation
4. Prothrombin time estimation
5. aPTT (activated partial thromboplastin time) estimation.
6. Clot retraction time.

BSMLT-303- SYSTEMIC BACTERIOLOGY, MYCOLOGY & VIROLOGY
THEORY

SYSTEMIC BACTERIOLOGY
Study of -
Staphylococcus, Streptococcus, Pneumococcus, Neisseira gonorrhoea, Neisseira meningitis, Corynbacterium diptheriae, Mycobacterium, Clostridium, E.coli, Klebsiella, Salmonella, Proteus, Pseudomonas, Vibrio & Spirochaetes with reference to their :
- Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis.

MYCOLOGY
- Morphology and Structure of fungi
- Classification of fungi
- Nutrition and cultivation of fungus
- Cutaneous & Sub cutaneous and Systemic Mycosis (in brief)
- Lab diagnosis of fungal Infections
- Opportunistic fungal infections

VIROLOGY
- General characters of viruses
- Classification of viruses
- Lab diagnosis of viral infections
- Cultivation of viruses
- Bacteriophages.
- Retro viruses - HIV, Hepatitis virus, Pox virus,
- Picrona virus - Polio
- Orthomyxo virus - Influenza
- Arbo virus - Chikungunya, Dengue
- Herpies and Adeno virus

PRACTICAL

SYSTEMIC BACTERIOLOGY
1. Culture Techniques
2. Composition of culture media
3. Preparation of media
4. Identification of media & their uses
5. Culture methods & identification of common bacteria on media.
6. Antibiotic sensitivity testing.

MYCOLOGY & VIROLOGY
1. Culture Media used for fungus.
2. Fungal culture
BSMLT-304- QUALITY LABORATORY MANAGEMENT & AUTOMATION

THEORY

AUTOMATION
1. Automation - Introduction, meaning, advantages, history
2. Continuous flow analyzers
3. Single channel continuous flow analyzers - advantages, disadvantages
4. Multi channel flow analyzers
5. Discrete auto analyzers - basic features, types, semi automated, fully automated
6. Batch analyzers
7. Random access analyzers (RAA)
8. Component steps in fully automated analyzers
9. Auto analyzers based on immunoassay techniques, Micro particle enzyme immunoassay (MEIA)
10. Various random access analyzers - Hitachi- 704, BM/Hitachi - 717
11. Centrifugal analyzers, ASCA
12. Dry chemistry analyzers
13. Dimension RxL clinical chemistry system
14. The Heterogeneous Immunoassay module components
15. Beckman Array 360 system
16. Mini Vidas analyzers
17. Immulite automated immunoassay analyzers
18. Latest trends in Automation, Biochips, Lab on a chip (LoC), Nanosensors advantages and disadvantages, PCR & its applications.

QUALITY LABORATORY MANAGEMENT
1. Introduction to Quality control
2. Total quality management framework
3. Quality laboratory processes, Quality assurance, Quality assessment, Quality control, Quality planning and Quality improvement
4. Costs of conformance and non conformance, appraisal costs, prevention costs
5. Internal quality control, basic steps, sources of error and their correction methods, CAPA - corrective action & preventive action
6. Sources of variation in laboratory results
7. Quality control charts, Levy- Jennings and Cusum charts
8. External quality control
9. Quality control programme, intrinsic and extrinsic and random errors
11. Demonstration of various methods of quality control.

PRACTICAL
CLINICAL BIOCHEMISTRY
(By Semiautoanalyzer / Fully automated analyzer)
1. Estimation of Cholesterol
2. Estimation of HDL Cholesterol
3. Estimation of LDL Cholesterol
4. Estimation of Triglycerides
5. Estimation of LDH
6. Estimation of Glucose
7. Estimation of Bilirubin (Total, Direct, Total + Direct)
8. Estimation of SGPT
9. Estimation of SGOT
10. Estimation of Acid Phosphatase
11. Estimation of Alkaline Phosphatase
12. Estimation of Iron
13. Estimation of Creatinine
14. Estimation of Urea
15. Estimation of Uric acid
16. Estimation of CK-MB
17. Estimation of CK-NAC
18. Estimation of Chlorides
19. Estimation of Sodium
20. Estimation of Potassium
21. Estimation of Hexagon Troponin+
22. Estimation of Phosphorus
23. Estimation of TIBC
24. Estimation of Albumin
25. Estimation of Calcium
26. Estimation of Hemoglobin
27. Estimation of Magnesium
28. Estimation of Blood Urea Nitrogen

ENDOCRINOLOGY, TUMOR AND CANCER MARKERS
(By ELISA Reader)
ENDOCRINOLOGY
1. Estimation of T3
2. Estimation of T4
3. Estimation of TSH
4. Estimation of FSH
5. Estimation of LH
6. Estimation of hCG
7. Estimation of Cortisol
8. Estimation of Progesterone
9. Estimation of Testosterone

TUMOR AND CANCER MARKERS
1. Estimation of Alpha feto proteins (AFP)
2. Estimation of Carcino embryonic antigen (CEA)
3. Estimation of CA -125
4. Estimation of Prostate specific antigen (PSA)

OTHER ELISA TESTS
1. Test for HIV
2. Test for Hepatitis B (HBsAg)
3. Test for Hepatitis (HCV)
4. Malaria antigen
5. Tuberculosis-IgG/IgM

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