1st year BMLT PATHOLOGY

Theory (Paper-101)

General Pathology

1.Necrosis- Definition, basic concepts & types.

2.Hyperplasia, Hypertrophy, Atrophy & Metaplasia- Definition & examples.

3. a) Inflammation- Definition basic feature of acute inflammation cardinal signs.

b) Chronic Inflammation- Basic concept, granuloma with examples.

4. Neoplasia- Definition, Benign vs malignant tumour, commonly used different laboratory tests in diagnosis of malignant lesions.

5. Hemodynamics- Overview, Basic concept of septic shock.

6. History taking and correlation with laboratory diagnosis of AMI, TB, Diabetes, Hypothyroidism and Hyperthyroidism.

Clinical Pathology & Haematology

7. Overview of haematopoiesis.

8. Anemia-Definition , morphological classification and diagnostic tests

9. Normal & abnormal Hb with special reference to Thalassemia. Hb electrophoresis

10. RBC indices & PCV estimation.

11. Overview of WBC production , morphology, common causes of leucocytosis & leukopenia.

12. Overview of platelet production common causes of thrombocytopenia.

13. Composition of urine, collection & preservation of urine

Physical examination- Colour, PH & specific gravity

Chemical examination – Protein, Sugar, ketone body , bile salt, bile pigment, blood ,chyle detection

Microscopic examination. - Cells, casts, crystals

14. Detection of micro albumin & 24 hrs urinary total protein estimation

15. Collection of blood & Anticoagulants. Phlebotomy and after care

16. Bone Marrow Aspiration & Bone Marrow Biopsy- Procedure , indications , contraindications , preparation of tray, smear, staining , Iron stain in Bone Marrow.

17.Basic concepts of jaundice, types, lab investigations.

1st year BMLT PATHOLOGY

Practical (Paper-101)

1.Estimation of Hb by Colorimetric method

2. Total count of RBC, WBC & platelet

3. PCV determination & RBC Indices calculation.

4. ESR estimation

5. Drawing of PBS, Romanowsky's stain , Stain preparation, Staining of PBS & recognition of cells & DC.

6. Absolute eosenophile count

7. Supravital staining & Reticulocyte count

8. Bone marrow smear preparation & staining

9. Iron stain in bone marrow

10. Urine RE & ME

11. Use of different types of dip sticks

12. Urine- Total protein estimation

1st YEAR BMLT MICROBIOLOGY
General and Systemic Bacteriology

THEORY (PAPER-102)

History of Microbiology and Classification:
History of microbiology, Discovery of microorganisms.
General characteristics and classification of bacteria

Microbial Cells - fine structure and function: Size, shape and arrangement of bacterial cells. Cell membrane, cell wall peptidoglycan structure, Gram +ve and Gram –ve cell wall, Capsule, flagella and movement, Bacterial endospore

Microbial Nutrition, Growth and control of Microorganisms by physical and chemical methods : culture media- synthetic and complex, types of media; isolation of pure cultures, growth curves, generation time;

Bacterial Genetics: Bacterial plasmid-fertility factor, col plasmid; bacterial conjugation-(Hfr, F′, F+ X F-), transformation, transduction (generalized).

Sterilization and Disinfection: Principles and use of equipments of sterilization namely Hot Air oven, Autoclave and serum Inspissator. Pasteurization, Antiseptic and disinfectants, phenolics, halogens, heavy water, sterilization gases).

Waste Disposal : Handling of waste ,waste segregation and management including disposal.

Systemic Bacteriology

Staphylococcus
Streptococcus
Pneumococcus
Neisseria
Corynebacterium
Bacillus sp
Clostridium
Enterobacteriaceae (Escherichia, Klebsiella, Proteus , Salmonella, Shigella)
Pseudomonas,
Vibrio
Miscellaneous bacteria : Over view of Bordetella, Brucella, Pasteurella, Haemophilus
Trponema
Introduction to Rickettsiae, Chlamydia, Mycoplasma

1st YEAR BMLT MICROBIOLOGY

PRACTICAL (102)

1. **Microscopy** - Light microscopy, Bright & Dark Field microscopy, Fluorescence microscopy, Phase Contrast microscopy, Concept of Electron Microscopy
2. **Sterilization**: Principles & operations – Autoclave, Hot air oven, Filtration, Laminar Air Flow / BioSafety cabinet.
3. **Microbial media** : Preparation of media for bacteria
4. **Collection of samples** and processing in microbiology laboratory
5. **Methods of inoculation of different microbes in common media :** Streak plate, spread plate, pour plate, serial dilution
6. **Staining techniques** : Differential Staining : Gram staining, , Albert staining, Acid fast staining, capsule staining, spore staining
7. Observation of morphology of bacteria – shape and arrangement
8. Hanging drop preparation,
9. **Isolation of bacteria** : different plating methods
10. **Identification of common Pathogenic bacteria**:- by staining & their biochemical tests.*(Catalase, Coagulase, Oxidase, IMVIC, Urease , etc.)* and Serological tests

1st Year BMLT Biochemistry

THEORY (Paper-103)

1. Elementary knowledge of general chemistry: atomic weight, molecular weight and equivalent weight; Molarity, Molality & Normality of solutions.
2. Acid, Base, pH & Buffer solutions; Physiological Buffers & Acid base balance.
3. Knowledge of lab organization, reporting and recording procedures, Ethics of laboratory practice; confidentiality of reports. Medico legal accepts of record keeping
4. Common laboratory hazards & safety measures for prevention.
5. Methods of collection, transport, packing and storage of specimens, the concept of pre analytical, analytical and post analytical errors.
6. Basic laboratory instruments & their uses, care, maintenance: Laboratory glasswares, Weighing balances, Incubator, Water bath, Centrifuge, pH meter; Colorimeter; Flame- photometer, Spectrophotometer, Fluorimeter, Ion selective electrodes.
7. Chemistry of carbohydrates: Introduction, Basic Classification; Reducing & Non-reducing Sugars; Osazone formation; digestion & absorption of carbohydrates;
8. Proteins and Amino acids: Amino acids: Definition & classification; Essential & non essentials amino acids; Proteins: Classification, General characteristics, Basic structure; Digestion & absorption of proteins.
9. Lipid & their metabolism**:** General introduction; Basic classification Simple & Compound lipids; Essential fatty acids: Physiological functions & deficiency; Biological membrane; Properties of Lipid aggregates (elementary idea), Digestion and absorption of lipids with detailed role of bile; Biochemical importance of fatty acid synthesis & fatty acids oxidation, Outline of Cholesterol synthesis with regulation, Ketogenesis; Lipoproteins (elementary idea);
10. Nucleic acid: Structural aspects - Components of DNA and RNA, Nucleosides & Nucleotides (introduction, structure & bonding), Double helical structure of DNA (Watson - Crick Model), various forms of DNA.
11. Enzymology**:** Definition, classification, mechanism of action
12. Vitamins: Fat soluble & water soluble vitamins; daily requirements, physiological functions and diseases of vitamin deficiency.
13. Minerals: Iron, calcium & phosphate: regulation at blood level, deficiency and excess.

1st Year BMLT Biochemistry

PRACTICAL (Paper-103)

1. Phlebotomy and collection of blood samples
2. Preparation of Solutions, Calculation of molecular weight and Equivalent weight.
3. Preparation of Normal, molar and Percent solutions.
4. Measurement of hydrogen ion concentration using pH meter
5. Qualitative analysis: identification of carbohydrate, protein.
6. Validation of Lambert's Beer's law
7. Principles & operations colorimeter & Spectrophotometer

1sty YEAR BMLT ANATOMY & PHYSIOLOGY
Theory (Paper-104)

Group A: Anatomy

1. **Cell:**
   Structure of cell & cell organelles

2. **Tissue:**
   Types, structure & location of tissues

3. **Cardiovascular System:**
   Basic anatomy of heart and important blood vessels

4. **Respiratory System:**
   Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs

5. **Digestive System:**
   Basic anatomy of oesophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas

6. **Excretory System:**
   Basic anatomy of kidney, General arrangement of urinary system

Suggested Readings:

1. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
2. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers
3. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley Publications

Group B: Physiology

7. Cell:

Functions of cell & cellular organelles, Transport across cell membrane, Cell communication

8. Tissue:

Functions of epithelial tissue, connective tissue, muscle tissue, nerve tissue

9. Body Fluid:

Blood- Composition & general function of plasma, Blood cells - structure, function, normal range & life span, Structure & function of haemoglobin
Lymphatic system- Composition & function of lymph, lymphatic tissue

10. Cardiovascular System:

Basic anatomy of heart, Blood & nerve supply of heart, Structure and function of arteries, vein & capillaries, Cardiac cycle, Heart sound, Blood pressure & its regulation, Factors affecting heart rate & blood pressure, Hypertension

11. Respiratory System:

Mechanism of respiration, Transport of oxygen & carbon-di-oxide, Gaseous exchange between lungs and tissues, Chloride shift, Oxyhaemoglobin dissociation curve, Lung volume & capacities, Respiratory acidosis & alkalosis

12. Digestive System:

General arrangement of alimentary canal, Organs of GIT -their structure & function, Structure & function of liver, gall bladder and pancreas

13. Excretory System:

Mechanism of formation of urine, Glomerular filtration rate, Micturation

14. Endocrine System:

Brief introduction about endocrine glands and their secretion, Classification of hormones, Endocrinological disorders, Different sex hormones and their functions

Suggested Readings:

1. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
2. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications
3. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier 5. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley publications

1sty YEAR BMLT ANATOMY & PHYSIOLOGY

Practical (Paper-103)

1. Demonstration of Major organs through models.
2. Measurement of pulse rate (radial pulse, carotid pulse).
3. Determination of Blood pressure by Auscultatory Method. Determination of mean pressure & pulse pressure. Study of the effect of change of posture (three posture – supine, sitting and standing) & exercise on blood pressure.
4. Determination of body density and fat percentage.
5. Measurement of respiratory rate.

2nd year BMLT PATHOLOGY

Theory (paper-201)

Histopathology & Cytopathology

Histopathology

1. Introduction to histopathological techniques
2. Receiving of specimens
3. Fixation
4. Step of tissue processing and embedding
5. Section cutting
6. Mounting
7. Staining & dyes.
8. Theory of Haematoxylin &Eosine staining
9. Microtome & its care
10. Decalcification
11. PAS stain
12. Reticulin stain & its uses
13. Van gieson's stain
14. Museum specimen preservation & mounting
15. Frozen section
16. IHC basic principles & utility
17. Immunofluorescence

Cytopathology, cytochemistry

1. Preparation of smear in fine needle aspiration cytology
2. Principle of exfoliative cytology
3. Preparation of smear from fluid, Fluid cytology, Imprint cytology, scrape & brush cytology
4. Examinatin of body fluids including CSF- transudate & exudates
5. Fixatin of smears
6. MGG stain/ Leishman-Giemsa staining
7. Papanicolaou staining , principles & uses in cervical smear.Identification of cells in that stain.
8. Cytospin- Basic principles & utility
9. Cell block preparation- basic principles & utility
10. Semen analysis
11. Liquid Based Cytology

2nd year BMLT PATHOLOGY

Practical (Paper-201)

1.Embedding & preparation of blocks

2. Section cutting , use & care of microtome

3. Stain preparation

4. Hematoxyline& Eosin staining

5. PAS staining .

6. Reticulin stain

7. Van Gieson stain

8. AFB staining (TB & Leprosy) in smear/ tissue section

9. MGG stain/ Leishman- Giemsa staining.

10 Pap stain

11. Preparation of smear from fluid.

12. Semen analysis

13. CSF examination.

2ND YEAR B M L T Microbiology
Medical Parasitology, Mycology, Virology & Entomology
THEORY (Paper-202)

Parasitology
Definition-Parasitism , Host , Vectors etc, Classification,
Protozoa-general, pathogenic and non pathogenic protozoa,
Nemathelminths/Round worms – Nematode ,
Platyhelminthes–class-Cestode,class-Trematode,
Lab diagnosis of medically important parasitic infection (Amoebiasis, Giardiasis, Leishmaniasis, Malaria, filariasis, Round worm, Hookworm, Pinworm infection etc).

Study of medically important fungi –
Candida,
Cryptococcus,
Aspergillus,
Dermatophytes
Dimorphic fungi

Virology
General characters &classification of Viruses
Bacteriophages
Pox virus
Adenovirus
Herpes Virus
Orthomyxo and Paramyxovirus
Hepatitis virus
RhabdoVirus
ARBO Virus
Oncogenic virus
Retro Viruses-HIV

MEDICAL ENTOMOLOGY
General idea with terminologies,arthropod borne disease,Vector borne diseases, mosquito transmitted disease, house fly transmitted diseases

2ND YEAR B M L T Microbiology

PRACTICAL (202)

1. Stool examination for Ova, Parasite, cyst
2. Examination of Pathogenic parasites from clinical specimens specially Stool
3. Collection, Preparation and identification of haemoparasites
4. Mycological culture media preparation
5. Germ tube test
6. KOH preparation
7. LCB mount
8. Collection, Preparation of samples and identification of common medically important fungi
9. Whole mount preparation of different disease causing arthropods.
10. Serological test related to viral diagnosis

2ND YEAR BMLT BIOCHEMISTRY

THEORY (PAPER-203)

1. Glycolysis, glycogenesis, glycogenolysis, Citric acid cycle, HMP shunt & Gluconeogenesis (Outline & biological importance only), Regulation of blood glucose level including hormonal influence, Estimation of glucose (Enzymatic methods), Heyperglycaemia and Hypoglycaemia, Glycosuria, Diabetes mellitus, Oral glucose tolerance test, Monitoring of blood glucose, Glycatedhemoglobin: estimation methods & clinical significance.

2. Protein- Transamination, transmethylation, urea cycle, ammonia formation & transport, Disorders due to defective urea cycle, Common metabolic disorders due to abnormal amino acid metabolism, Abnormal digestion of proteins, Hyperproteinemia, Hypoproteinemia, Uremia, Creatininemia.

3. Common disorders of Lipids-digestion & absorption, Lipid transport with special emphasis on importance of various apoproteins&apolipoproteins; Abnormalities in cholesterol metabolism & Ketoacidosis; Dyslipidemias; Clinical aspects of eicosanoids & prostaglandins (Elementary idea); cholesterol & Lipoproteins in the blood, their composition & their relation to Atherosclerosis, clinical aspects of eicasanoid& prostaglandins, lipid profile (cholesterol, triglyceride, lipoproteins, phospholipids) and its significance in various disorders.

4. Hormones- Classification, role of biologically important hormones; Synthesis and diagnostic importance of thyroid, adrenal and sex hormones and disease correlation. Laboratory tests fordetection of hormone levels in blood.

5. Electrolytes : Sodium & Potassium metabolism & their clinicalsignificance

6. Enzymes &isoenzymes of clinical importance (Part I): Diagnostic value of serum enzyme- AST, ALT, Alkaline phosphatase, Acid phosphatase
7. General idea about renal function test, liver function test, thyroid functiontest

2ND YEAR BMLT BIOCHEMISTRY

PRACTICAL (Paper-203)

- Estimation of:Glucose, Urea, Creatinine, Bilirubin (Total & Direct), Uric acid, Albumin, Globulin & Total protein inblood

3rd year BMLT PATHOLOGY

Theory (Paper-301)

Blood Banking & Special haematology

1.Collection and Handling of Blood- Standardise procedure, phlebotomy tray, Blood film preparation, differences between capillary and venous blood, Anticoagulant used

2. Storage of blood and its transportation, effects of storage on Blood count and Blood morphology.

3. Principle of Blood grouping, false positive and false negative reaction. Coomb's test/ Du test

4. Blood component separation- principles , preparation & uses

5. Laboratory aspects of Blood Transfusion in total or in fractionated components, Cross matching

6. Mandatory blood tests in blood banking with donor's blood.

7. Apharesis: An overview

8. Disorders of mismatched blood transfusion , General idea about Blood Transfusion related diseases

9. Wastage of blood units- possibilities.

10. Introduction to Automation in haematology- Principle , advantages, cautions,

11. Classification & lab diagnosis of Leukemias

12. Leukaemia vs leukemoid reaction.

13. Cytochemical stains for Differential diagnosis of leukemia

14. Flow cytometry

15. Basic concepts of Haemorrhagic disorders.

16. Basic concepts of coagulation disorders.

3rd year BMLT PATHOLOGY

Practical (Paper-301)

1. Training at blood bank and submission of report and discussion
2. ABO blood grouping and Rh typing
3. Coombs test
4. Cross matching
5. Reverse grouping
6. Identification of abnormal cells in PBS
7. MPO, PAS stain, SBB staining of Bone marrow smears for differential diagnosis of leukaemia.
8. BT, CT, PT, APTT & INR

3RD YEAR BMLT (Microbiology)

CLINICAL IMMUNOLOGY, MYCOBACTERIOLOGY & APPLICATION

THEORY (Paper-302)

Part A

1. Introduction of cells and organs of the immune system.
2. Types of immunity – cellular, humoral, active, passive, natural and acquired immunity
3. Overview of Antigen &Adjuvant.
4. Types, structure and specific functions of different immunoglobulin.
5. Antigen – Antibody reactions
6. Major histocompatibility complex – different types and functions.
7. Organ transplantation (overview).
8. Immunodeficiency diseases (overview with special reference to AIDS).
9. Hypersensitivity reactions,
10. Serological reactions related to infectious and immune mediated Diseases
11. Monoclonal antibody production

Part B

Mycobacteriology

Normal flora of various sites in human body

Presence of microorganisms in environment: Sampling and quantification of microorganisms in air, soil and water.

Quality control of culture media and quality control of staining techniques

3RD YEAR BMLT (Microbiology)

PRACTICAL (302)

1. Mantouxtest.
2. ELISA test.
3. Immuno chromatographic devices for HIV/HCV/HBs Ag etc
4. VDRL/ RPR Test,
5. Widal Test,RA factor,CRP,ASO titre.
6. Antibiotic sensitivity test
7. MIC test
8. Preparation of LJ medium
9. Bacteriological analysis of water for faecal coliforms, coliform count.
10. Drawing of blood from animals

3RD YEAR BMLT BIOCHEMISTRY

THEORY (Paper-303)

1. Separation & Identification of Techniques –

(i) Electrophoresis: Definition, Principle, Types, Clinical Applications (Special emphasis on Agarose Gel electrophoresis, PAGE, Paper electrophoresis)

(ii) Chromatography: Definition, Principle, Types, Clinical Applications

(iii) ELISA: Definition, Principle, Types, Clinical Applications

(iv) Chemiluminiscence: Definition, Principle, Types, Clinical Applications

(v) Blotting Techniques (Elementary idea on Western, Southern, Northern Blotting)

(vi) PCR: Definition, Principle, Types, Clinical Applications

2. Instrumentation and biochemical techniques- Principle and applications of Semi autoanalyzer, Random Autoanalyzer, Ion selective electrodes

3. (i) Introduction to Qualityassurance; Requirements of quality control programme - Organization, quality manual, work instruction. Concept of external & internal quality control, proficiency testing.

(ii) Quality control measurement- Accuracy, precession, reliability, pre and post analyticalVariables.

(ii) Mean, Median, Mode, Standard deviation, Normal distribution curve and Laboratory resultcorrelation.

4. Principlesof Isolation of human DNA& RNA.

5. Biomarkers, Enzymes &isoenzymes of clinical importance (Part II): Prostate specific antigen, Creatinine kinase, Cardiac troponins, Acid phosphatase, LDH, Lipase, Amylase, Carbonic anhydraseetc

3RD YEAR BMLT BIOCHEMISTRY

PRACTICAL (Paper-303)

1. Assay of T_3/T_4/TSH/LH/FSH/Insulin/Glucagon/ Estrogens/ Progesterone/Prolactin hormones/ SGOT/SGPT in blood by ELISA Technique.
2. Estimation of Amylase, Lipase, Creatinine kinase, LDH