

THE WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

DD 36, 2nd Avenue, DD Block, Sector 1, Bidhannagar, Kolkata,
West Bengal 700064

RULES AND REGULATIONS FOR CONDUCTING B.Sc. IN MEDICAL LABORATORY TECHNOLOGY (BMLT) COURSE UNDER WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

ELIGIBILITY CRITERIA FOR ADMISSION IN B.Sc. IN MEDICAL LABORATORY TECHNOLOGY UNDER WEST BENGAL UNIVERSITY OF HEALTH SCIENCES

1. The candidate should have passed 10+2 examination with Physics, Chemistry and Biology as combination subject from a recognized board of West Bengal or CBSE or ICSE board or any other recognized board.
2. Candidates, who have passed DMLT from State Medical Faculty of West Bengal or any recognized Institute/Faculty, can enter laterally in 2nd year provided there is any vacant seat. The eligibility for lateral entry will be decided by the WBUHS.
3. Candidates must be passed with Physics, Chemistry, Biology, English & Vernacular or other fifth subject with individual pass marks (in both theory & Practical, wherever applicable). The candidate must also secure minimum 50% in aggregate(40% for SC/ST/OBC A& B, PWD candidates)in 10+2 examination for admission in BMLT course.
4. Age limit = not less than 17 yrs and maximum age limit is 40 years (Five years relaxation for in-service Medical Technologists).
5. Candidates must be citizen of India and domicile of West Bengal

EXAMINATION (RULES & REGULATIONS)

1) Eligibility for appearing in BSc Medical Laboratory Examination:

Clause 1

Minimum 75 % attendance in each paper in both Practical and theory individually is compulsory to appear in the University examinations. Practical includes Department wise clinical/ laboratory posting and practical classes.

Shortage of attendance in any one of the above mentioned component will be considered as ineligibility to appear in University examination for that subject.

Clause 2

Minimum 40%marks in each paper in internal assessment in both Theory and Practical individually is compulsory to appear in the University examinations.

Internal assessment examination will be conducted at least 30 days before the university examination.

Marks obtained in the internal assessment will not be added with the marks obtained in the University Examination.

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Clause 1 and Clause 2 both must be fulfilled to appear in the University examinations.

To appear in the 3rd Year BMLT University Examination students have to acquire minimum 40% marks in paper 304 also.

- 2) The University examination will be conducted at the end of each year (1styr) by the WBUHS. Candidate should clear all the papers of theory & practical to promote for the 2nd year & the same procedure will be followed for 2nd and 3rd year university examination. After passing final University Examination compulsory rotational internship training 6 months at any recognized Hospital or Medical Institute is mandatory to achieve complete training certificate.

**At the end of 1st year students have to appear in university examination
 Proposed marks distribution for 1st year students to promote in 2nd year**

Paper code	Paper name	Theory	Practical & Oral	Total Marks
Paper101	General Pathology ,Clinical pathology and Hematology	100 marks	70marks (Practical) 30 marks (Oral)	200
Paper 102	General and systemic Bacteriology	100 marks	70marks (Practical) 30 marks (Oral)	200
Paper 103	Basic Biochemistry	100 marks	70marks (Practical) 30 marks (Oral))	200
Paper 104 A *	Basics of Human Anatomy	50 marks	35 marks (Practical) 15 marks (Oral))	100
Paper 104 B	Basics of Human Physiology	50 marks	35 marks (Practical) 15 marks (Oral))	100
Total				800

* **Theory** Paper 104 A and 104 B will be conducted in the same day

3. Student failed in any paper (theory or practical), may be allowed to continue classes of next higher year but unless he/she pass all the subjects, he/she will not be allowed to appear exam of next higher year.

The candidate can continue the classes of 2nd or 3rd year without passing all the subjects of 1st or 2nd year BMLT exam respectively. But in any case, the candidate must complete the entire course within 6 years of beginning of the course.

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Theoretical & practical- at the end of 2nd year students have to appear in university exam

Proposed marks distribution for 2nd year students to promote in 3rd year

Paper code	Paper name	Theory	Practical & Oral	Total Marks
Paper 201	Histopathology and Cytotechnology	100 marks	70 marks (Practical) 30 marks (Oral)	200
Paper 202	Medical parasitology, mycology, virology & entomology	100 marks	70 marks (Practical) 30 marks (Oral)	200
Paper 203	Advanced Biochemistry	100 marks	70 marks (Practical) 30 marks (Oral)	200
Total				600

4. The students appearing for the final year examination of the university (WBUHS) will have to clear both the 1st year & 2nd year examinations.

Marks distribution of 3rd year (final) Examination

Paper Code	Paper name	Theory	Practical & Oral	Total Marks
Paper 301	Blood Bank & Special Hematology	100 marks	70marks (Practical) 30 marks (Oral)	200
Paper 302	Clinical Immunology, Mycobacteriology and Applied Microbiology	100 marks	70marks (Practical) 30 marks (Oral)	200
Paper 303	Clinical Biochemistry	100 marks	70marks (Practical) 30 marks (Oral)	200
Paper 304*	Basic Computer Applications	Non-University Examination		
				Total=600

* Non-University Examination grade should be shown in marksheet separately and Grade will be given by the respective college.

Grade will be as FOLLOWS:

A= \geq 80 %

B= \geq 60% to < 80%

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C= $\geq 40\%$ to $< 60\%$

D= $< 40\%$ (Fail)

WBUHS FINAL EXAMINATION- The BSC MLT examination shall be conducted by a board of examiners consisting of Minimum of 1 internal + 1 external for each paper/ subject appointed by the COE of WBUHS, to be suggested from the Board of studies (BOS) of BMLT course. For Paper 104A and 104B separate set of examiners (one internal and one External) is required.

Examiners selection procedure: Professor ,Associate professor or Assistant Professor with 4 years teaching experience from any recognized medical college or any recognized College/Institute under different Universities .

The examiners be actively related to teaching of DMLT/BMLT course of West Bengal state Medical Council or of the WBUHS University.

Paper setter must be actively related to teaching of DMLT/BMLT course of West Bengal state Medical Council or of the WBUHS University.

Theory questions may be set by Internal examiners from the Institutes under WBUHS, appointed by Controller of Examinations, WBUHS and to be decided in Board of studies meeting. Each theory paper questions to be set finally will require questions set two (02) in nos. followed by Moderation.

Moderation of theory questions- to be decided by The University of Health Sciences suggested by Members of BOS to be appointed by COE . He/she must be in designation of professor /Associate Professor with 5yrs teaching experiences in concerned discipline.

Theory questions pattern may be:

Question Paper of 100 marks

Group A: 20 questions MCQ pattern- each will carry-1 mark

20x1=20

Group B: 5 Questions very short answer type- each will carry 2 marks

5X2=10

Group C: 6 questions, Short Answer Type (structured) each will carry 5 marks 6 x 5=30 (Will attempt 6 questions out of 8)

Group D: 1 long question/problems oriented (structured) each will carry 10 marks 1x10=10 (Will attempt 1 question out of 2)

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Group E: 2 long questions (structured) each will carry 15 marks 2x15=30 (Will attempt 2 questions out of 3)

Question Paper of 50 marks

Group A: 10 questions MCQ pattern- each will carry-1 mark. 10x1=10

Group B: 4 questions Short Answer Type (structured) each will carry 5 marks. 4 x 5=20 (Will attempt 4 questions out of 6)

Group C: 2 long questions (structured) each will carry 10 marks 2x10=20 (Will attempt 2 questions out of 3)

Practical question pattern may be:

For Practical consists of 70 marks

- 1. Practical note book 5 (maximum) [Laboratory Note book is compulsory]**
- 2. Spotting 10 (maximum)**
- 3. Lab tests 55 marks**

Rules of passing

- The candidate must secure minimum of 40% marks in each heads of theory and practical examination to be declared pass. The internal marks should be 40% (i.e., 12 out of 30) to appear in the Final University Examination.
- Pass with Honours in a paper : 75% marks or more in that paper provided passed in all other papers of that year
- Less than 40% marks- Fail.
- Each successful candidate shall receive first a provisional Certificate in the form prescribed by West Bengal University of Health Sciences.
- Each passed candidate after 3rd year University Examination and the successfully completion of compulsory rotator internship shall receive a degree 'BSc. in Medical Laboratory Technology or BSc. MLT in prescribed form of WBUHS.
- A candidate who fails to pass or present himself for the examination shall not be entitled to claim a refund of Fees and Fees shall not be carried over to subsequent examination.
- A candidate, who has once failed to pass in the University examination, may appear in the subsequent supplementary examination on payment of the Fees chargeable as per WBUHS rules. The supplementary examination will be held within 6 weeks to 3 months after provisional declaration of result of BSc. MLT. Students who fails in 1st year examinations should not be allowed to appear in 2nd year examination unless

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he/she passes all subjects of 1st year examination . This will be applicable for all the 3 years.

- A candidate should be allowed to pass a particular examination for 4 chances.
- A candidate may continue maximum 6 years in the course.
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Compulsory Six months Internship:-

- The successfully provisionally passed candidates will be placed by the Principal / Director of the Institutes; in consultation with the convener/ In charge of BSC in Medical Laboratory Technology for next hands-on experience & training in the following departments by rotation.

Pathology-1 month.

Microbiology- 1month,

Biochemistry- 1 month,

Central Laboratory- 2months,

Blood Bank-1month

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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.

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 eosinophil count
7. Supravital staining & Reticulocyte count
8. Bone marrow smear preparation & staining
9. Iron stain in bone marrow
10. Urine RE & ME

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11. Use of different types of dip sticks

12. Urine- Total protein estimation

1stYEAR BMLT MICROBIOLOGY THEORY (PAPER-102)

General and Systemic Bacteriology

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

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.

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- 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 &

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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.

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

1ST 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
7. **Reproductive System**
Male reproductive organs, female reproductive organs, puberty, menstrual cycle, Spermatogenesis, Oogenesis, Menopause

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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

8. Cell:

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

9. Tissue:

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

10.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

11.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

12.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

13. Digestive System:

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

14. Excretory System:

Mechanism of formation of urine, Glomerular filtration rate, Micturation

15. 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

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2. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications
3. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunders/Elsevier
5. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley publications

PRACTICAL

(Paper-104A)

1. Demonstration of Major organs through models.
2. Surface marking of major veins and arteries

(Paper-104B)

3. Measurement of pulse rate (radial pulse, carotid pulse).
4. 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.
5. Determination of body density and fat percentage.
6. Measurement of respiratory rate.

2ND YEAR BMLT PATHOLOGY
THEORY (PAPER-201)
HISTOPATHOLOGY & CYTOPATHOLOGY

Histopathology

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

Cytopathology, cytochemistry

1. Preparation of smear in fine needle aspiration cytology
- 2.Principle of exfoliative cytology

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3. Preparation of smear from fluid, Fluid cytology, Imprint cytology, scrape & brush cytology
4. Examination of body fluids including CSF- transudate & exudates
5. Fixation 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

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2ND YEAR BMLT MICROBIOLOGY
THEORY (PAPER-202)

Medical Parasitology, Mycology, Virology & Entomology

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

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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), Hyperglycaemia and Hypoglycaemia, Glycosuria, Diabetes mellitus, Oral glucose tolerance test, Monitoring of blood glucose, Glycated hemoglobin: 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 & lipoproteins; 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 eicosanoid & 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 for detection of hormone levels in blood.
5. Electrolytes : Sodium & Potassium metabolism & their clinical significance
6. Enzymes & isoenzymes of clinical importance (Part I): Diagnostic value of serum enzyme- AST, ALT, Alkaline phosphatase, Acid phosphatase

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7. General idea about renal function test, liver function test, thyroid function test

2ND YEAR BMLT BIOCHEMISTRY PRACTICAL (PAPER-203)

1. Estimation of: Glucose, Urea, Creatinine, Bilirubin (Total & Direct), Uric acid, Albumin, Globulin & Total protein in blood.

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. Apheresis: 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.

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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

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3RD YEAR BMLT (MICROBIOLOGY)
PRACTICAL (302)

1. Mantoux test.
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) Chemiluminescence: 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 Quality assurance; Requirements of quality control programme - Organization, quality manual, work instruction. Concept of external & internal quality control, proficiency testing.
 - (ii) Quality control measurement- Accuracy, precision, reliability, pre and post analytical Variables.
 - (ii) Mean, Median, Mode, Standard deviation, Normal distribution curve and Laboratory result correlation.

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4. Principles of 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 anhydrase etc

3RD YEAR BMLT BIOCHEMISTRY

PRACTICAL (PAPER-303)

1. Assay of T₃/T₄/TSH/LH/FSH/Insulin/Glucagon/ Estrogens/ Progesterone/Prolactin hormones/ SGOT/SGPT in blood by ELISA Technique.
2. Estimation of Amylase, Lipase, Creatinine kinase, LDH