DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY
(DMLT) COURSE CURRICULUM

GENERAL INFORMATION

1. The Duration of Diploma Course of Medical Laboratory Technology (DMLT) is two years.
2. The minimum educational qualification for selection of trainees for the Diploma Course of Medical Laboratory Technology is +2 Science with Biology as one of the subject.
3. Total marks of the DMLT Course is 1000.
4. Minimum pass mark of the trainees if 50% in Theory, 50% in Oral & 50% in Practical.
5. 1st Class mark is 60% in Theory, Practical & Oral in aggregate respectively.
6. Less than 40% either in Theory or in Practical or in Oral in any paper will be treated as unsuccessful (Fail).

PART-1

BASIC COURSE ON MEDICAL LABORATORY TECHNOLOGY

Duration - 4 Months

Subject **16 weeks (110hrs)**

1. Anatomy (Theory+ Practical) – 20hrs+10hrs
2. Physiology (Theory + Practical) - 20hrs+10hrs
3. Comm. Medicine, Computer Science+Statistics(Theory+ Practical) – 20hrs+10hrs
4. Pharmacology (Theory) – 20hrs

EXAM - First

Total Marks – 200
Theory - 140 + Practical 60

Theory Paper I	Anatomy	35
	Physiology	35
Theory Paper II	Comm. Medicine, Computer Science + Statistics	35
	Pharmacology	35
Practical	Anatomy	20
	Physiology	20
	Comm. Medicine	20

SECTION-I

ANATOMY **Total period - 4 months**

Theory – 20 hrs. **Marks - 35**

1. **Introduction to the subject -** Anatomical position, common planes & Anatomical terms. -Different branches of Anatomy.
2. **Histology -**Typical animal cell (Structure & Function) -4 primary tissues (Classification & function)
3. **Skeletal System -** Axial and appendicular bones -Joints &movements
4. **Skin, Fascia and Muscles & Tendons**
5. **Circulatory System –**Heart, Blood Vessels, Lymphatic & R.E.System -Spleen, Thymus & Tonsils
6. **Respiratory System-** Nose, Pharynx, Larynx, Trachea, Bronchi Lungs and Pleura
7. **Digestive System-** Alimentary canal (different parts)-Liver, Gall Bladder, Pancreases Peritoneum
8. **Urogenital System-** Different parts of urinary system -Different parts of Male & Female genital -System (Internal & External Genitalia)
9. **Special Senses& General Sensibilities-** Eye & Vision-Ears, Hearing & Equilibrium, -Taste & 01 factory sensations, General Sensibilities like touch, pain, temperature.
10. **Central & Peripheral nervous system-** Brain & Spinal Cord.- Cranial & Spinal Nervous.- Autonomic Nervous System.
11. **Regional Anatomy (Only Demonstration)–** Extremities, Head & Neck, Thorax,Abd. & Pelvis, **Surface Anatomy,** Important Blood Vessels, Important Nerve, Important Muscles for Injection.

Practical – 10hrs **Marks - 20**

SECTION-II

PHYSIOLOGY **Total Period – 4 months**

Theory – 20 hrs. **Mark – 35**

1- **Blood-** Composition and general function of blood.Description of blood cells - normal counts & function.Steps of congratulation, Anticoagulants.Cerebrospinal Fluid, Formation, Composition & Function. Importance of blood groups composition & function of lymph.

2- **Reparatory System -**Name of structures involved in respirations and their function. External and internal respiration. How inspiration, expiration are brought about Transport of O_2 and CO_2 in the blood. Definition of respiratory rate, Tidal volume, vital capacity, Hypoxia.

3- **Excretory System**-Functions of Kidney, Nephron - Functions of Glomerulus and tubules, compositions of Urine, normal& abnormal. Skin- Function of Skin.

4- **Digestive System-**Composition and functions of saliva, mastication and deglutition. Functions of stomach, composition of gastric juice. Pancreatic Juice, Bile and Digestion of food by different Enzymes, Absorption and Defecation.

5- **Endocrine-glands**-Definition of endocrine gland, Names of the endocrine gland and the hormone secreted by them.Major actions of such Hormones.

6- **Reproductive System-**Name of primary and accessory organs in male and female. Name of secondary sexual characters in male and female. Function of ovary-formation of ova, actions of ovarian hormone, menstrual cycle.Functions of Testes-Spermatogenesis and secretions of testosterone. Fertilization Vasectomy and tubectomy.

Practical – 10hrs **Marks - 20**

Note: The teaching of Anatomy & Physiology should be coordinated so that structure and function of different parts of human body are correlated.

Only brief outline of the subjects to be given.

SECTION-III

PHARMACOLOGY **Total period - 4 months**

Theory – 20 hrs. **Mark-35**

1. **General Pharmacology**
   Drug, Drug nomenclature, Route of administration, concept of Pharmacokinetics, Pharmaco-dynamics and Adverse during action.

2. **Drugs for the diseases of fundamental System**
   GI System.Respiratory System.Cardiovascular System.Blood, Blood Coagulation, Thrombosis, different types of anti-coagula (Special emphasis).Drugs affecting the Urine and renal functions, excretion of drugs in stool, bile and other body fluids (Special emphasis).
3. **Drugs for diseases of integrating systems of body**
   Central Nervous System.Autonomic System.Endocrine System and autacoids.
4. **Chemotherapeutic Agents**
   Anti-Viral including AIDs, Hepatitis.Anti-Bacterial Drugs.Anti-Fungal Drugs.
   Anti-Protozoan Drugs.Anthelmintics.Anti-Cancer Drugs.
5. **Antiseptic, disinfectants.**
6. **Drugs interfering in different Pathological tests.**
7. **Measurement of Drug levels in different body fluids and significance.**

SECTION-IV

COMMUNITY MEDICINE (SPM) **Total period - 4 months**

Theory – 20 hrs.

Part A **Mark-15**

1. Identification and Public Health Importance of arthropods (Entomology): Mosquitoes, Lice, Fleas, Flies, Rats & Rodents.
2. Water Sources:
   Types, Purification

   Bio-Medical Waste Management

   Sanitation in Public Health
3. Food and Nutrition: Collection of different food samples :Cereals, Pulses, Vegetables, Roots and tubers, Fats and oils, Animal foods including milk

   Food-borne diseases of Public Health importance, Assessment of Nutritional status.

Part B **Mark-15**

STATISTICS-GENERAL

TABULATIONS	:	Simple Tables, Frequency Distribution Tables
DIAGRAMS	:	Bar Diagrams, Histogram, Line Diagram Pie Diagram
STATISTICAL AVERAGES	:	Mean, Median, Mode
MEASURES OF DISPESION	:	Normal Curve, Range, Standard Deviation Standard Error.
TESTS OF SIGNIFICANCE	:	't' Test.

Part C **Mark-5**

COMPUTER

1. **Computer Basics:**
   Importance, History, Computer Generation, Types of Computer, Anatomy of Computer, Input –output Devices, Processing Units and outline of Data Processing, Computer memory, external storage devices, Hardware, Software
   Basic functioning of Computers.
2. **Computer and Communication, Networking, Internet**
3. **Use of computer in Radio-diagnosis/Pathology Laboratory**

Practical – 10hrs **Marks - 20**

PART-2 (FIRST DMLT)

TOTAL MARK- 400, DURATION OF COURSE - 10 MONTHS

PAPER	SUBJECT	MARKS	TOTAL MARKS	DURATION
PAPER-I	PATHOLOGY			
	THEORY	100	150	10 MONTHS
	IMMUNOHEMATOLOGY			
	BLOOD BANKING			
	HEMATOLOGY			
	PRACTICAL	30		
	ORAL	20		
PAPER-II	MICROBIOLOGY			
	THEORY	100	150	10 MONTHS
	GEN. BACTERIOLOGY			
	SYST. BACTERIOLOGY			
	CLIN. MICROBIOLOGY			
	MYCOLOGY			
	PRACTICAL	30		
	ORAL	20		
PAPER-III	BIOCHEMISTRY			
	THEORY	60	100	10 MONTHS

1. Chemistry of
   a) Carbohydrates including proctiglycom
   b) Fat
   c) Prosthesis & Amino acid
2. Water & Fat soluble Vitamin, Plasma protein.
3. Enzyms (Classification, factors regulating, institution 2 clinical application)
4. Buffers, Molarily, indicators, Radiosolips, Radiation hazard, RSA.
5. Overview of Iron, Calcium, Iodine, Flourine.
6. Overview of Nucleic Acids & Uric Acid.

	PRACTICAL	25		
	ORAL	15		

PART-2 (FIRST DMLT)- details

PAPER-I PATHOLOGY

Total Marks: 150 Theory -100, Practical-30, Oral-20

IMMUNO HAEMATOLOGY & BLOOD BANKING

THEORY.

Introduction, Human blood group antigens, ABO blood group system and incompatibility, Rh blood group system and incompatibility , Technique of grouping and cross matching , Commb's test, Direct, Indirect , Blood Transfusion Procedure, Complication of blood transfusion, Blood Collection, Selection and Screening of donors., Collection of blood, Storage of blood, Cell separator and transfusion of various components of blood like Plasma and Platelet Separation , Organization, Operation and Administration of Blood Bank and anticoagulants.

ORAL AND PRACTICAL

ABO-Blood Grouping : Slide technique, Cross matching, -Major Cross Matching -Minor Cross Matching, Rh.-Typing, Coomb's Test –Direct, Indirect , Donor Screening and Selection, Identification, Recording, Grouping and typing of donor's blood., Drawing of blood – Asepsis, Measurance, Venipuncture, Collection.,Blood, Preservation and Storage , Recording the details and storage of blood, Maintenance, cleaning of various equipments used in the blood bank.

CLINICAL PATHOLOGY & HAEMATOLOGY

Urine analysis, Physical, chemical, microscopic., Routine tests viz. Sugar, Albumin and Phosphates., Other tests viz. Bile salt, Bile pigment, Urobilin Ketone bodies, Chyle, Specific gravity, Total protein (Esbachs) etc., Faecal analysis for occult blood examination., Preparation of Scminal Fluid for analysis. , Preparation of aspiration fluids. , Ascitic fluid, Pleural fluid ,CSF , Others, Introduction to haematology. , Collection of blood sample and anticoagulants., Red Cell Counts, Haemocytometer and procedure for R.B.C. Count., RBC diluting Fluid , Calculation , Write Cell Count, Procedure for W.B.C count , WBC diluting fluid , Calculation , Differential white cell count. , Morphology of write cell, Normal values, Romanosky Stains , Counting methods , Absolute Eosinophil Count Direct/Indirect smear examination., ESR, Westergren's, Wintrobe's, Factors affecting ESR, Importance and Limitation , Normal value and interpretation. , Packed Cell Volume (Haematocrit), Macro and Micro method ,Interpretation., Haemoglobin estimation , Colorimetric method ,Sahali's method, Cyanmethaemoglobin method. ,

Interpretation of result , Red Cell Indices, Calculation and importance of Reticulocyte count., Method-Interpretation ,Sickle Cell Preparation , Osmotic fragility test- Interpretation ,Estimation of G-6-PD, Principle of Electrophoresis. , Preparation of bone marrow aspiration and trephine biopsy.,Coagulation test: , Bleeding time , Whole blood coagulation time , Clot retraction test , Prothrombin time , Platelet count, Comments on peripheral smear., LE Cell Phenomenon.

ORAL AND PRACTICAL

1. Analysis of Urine for routine and others tests.
2. Urine microscopic examination.
3. Faeces occult blood test.
4. Seminal fluid analysis.
5. Analysis of aspiration fluids.
6. Staining and examination of different smears.
7. Use of Microscope, care and Maintenance.
8. Haemoglobin estimation –Sahali's
9. Demonstration of colorimetric Hb estimation.
10. Total RBC Count.
11. Total Leucoyte Count.
12. Differential count of Leucocyte.
13. Reticulocyte
14. Total platelet count, Direct, Indirect
15. Absolute Eosnophil count, Direct , Indirect
16. Bleeding time and clotting time.
17. Examination of Blood Parasites., Malaria Parasite, Microfilaria
18. Prothromibin time-Demonstration
19. ESR-Westergren's&Wintrobes
20. POV (Haematocrit)
21. Sickle Cell Test
22. Osmotic Fragility Test
23. Estimation of G-6-PD
24. Electrophoresis Test
25. Comments' on peripheral smear
26. LE Cell phenomenon.

PAPER-II MICROBIOLOGY

Total Marks: 150 Theory -100, Practical-30, Oral-20

GENERAL BACTERIOLOGY

- History of Microbiology, Microbes and their classification , Study of different , microscopes, Morphology of bacteria, Motional requirements of bacteria, Preparation and uses of culture media, Culture methods and identification of bacteria

Sterilization and Disinfection

- Physical Chemical, Mechanical methods, Sterilization of media, syringe, glassware's etc., Safe disposal of contaminated media etc.

Common Laboratory equipments and uses

- Different microscope, incubator, BOD incubator, Refrigerator, Deep Freeze,
- Hot air oven, Autoclave, Inspissator, Bacterial Filters, Water bath, VDRI rotation Centrifuge machine, Vacuum pump, media pouring chamber EUSA reader,etc
  Anaerobic culture, Inoculation techniques, subculture and maintenance of stock culture.Isolation and identification of bacteria (Cultural characters biochemical reaction) serotyping etc. Antimicrobial susceptibility tests

SYSTEMIC BACTERIOLOGY

More importance should be given to culture methods and identification of bacteria that other properties like Pathogenesis etc.

Cocci - Staphylococci, streptococci,Pneumococci, Gonococci, Meniogococci.

Bacilli – Corynebacterium, Bacillus, Clostridium, Nonsporing anaerobes, Enterobacteriaceae, E.Coll,Klebsiella, Salmonella, Shiegella, Proteus, Vibrio

- Pseudomonas, Mycobacterium (M. tuberculosis, M. Leprae), Basic idea on Actinocycetes,Ricketsiaeae, - Spirochetes

CLINICAL MICROBIOLOGY

- Normal microbial flora of human body, Collection and transport of specimen
- BacterimiaPyaemia, Septicemia, Pyrexia of unknown origin (P.U.O)
- Meningitis, Food Poisoning , Respiratory Infection (Sore throat pneumonic, pulmonary Tuberculosis), Nosocomial Infections, Opportunistic Infection

MYCOLOGY

- Classification of pathogenic Fungi, Morphology of Fungi, Laboratory diagnosis of Fungi (KOH prepn. Culture media and methods, LCB mount, etc.)
- Brief idea on Dermatophytes, Candia Aspergillums, Cryptococcus and Opportunistic Fungi.

PRACTICAL & ORAL MARKS - 30+20

General Introduction-Safety measures in the laboratory, First Aid in Laboratory accidents and general precaution- any measures. ,Handling and care of microscopes., Operation and maintenance of laboratory equipments, Anaerobic jor and other methods of anaerobic culture, Care and cleaning of all glassware (test tubes, slides petridishes pipettes, beakers, Rashes, funnels, syingesetc), Collection & transport of clinical specimens (Blood CSF Urine, Stool, Bone marrow, Sputum, Swabs, Aspiration fluid etc)., Receipts, Labeling, recording and dispatching clinical specimens., Keeping records after final computerization., Conversant with S.I. unit system for reporting. , Conversant with Fundamental Chemistry, I.e. use of indicators, strength of a solution, percent solution, part-dilution, molar solution, normal solutions etc.

Various staining technique:- Simple stain, Gram's stain, Z.N. stain, Albert's stain, Negative stain, Spore stain, Neisser's stain, Lactophenol cotton blue staining for fungi, Leishman stain, Geimsa stain, Other special stain,

Wet preparations like Hanging drop preparation, KoH preparation for fungi, Vaginal fluid examination, -Isolation of bacteria in pure culture and Antibiotic sensitivity., -Identification of common bacteria by studying their morphology, cultural character, Biochemical reactions, slide agglutination and other tests., Maintenance and preservation of stock culture. , Study of fungi by wet preparation, staining, culture etc.

CLINICAL MICROBIOLOGY:-

Approach to various clinical syndromes

Collection transport and processing of various clinical specimens , i.e. blood, CSF urine swabs faeces, etc. For microbiological diagnosis.,Investigation of various common epidemics , Gastroenteritis, Cholera, Food poisoning, Meningitis , Encephalitis, P.U.O., Study of nosocomial infection.

PAPER-III BIOCHEMISTRY

Total Marks: 100 Theory -60, Practical-25, Oral-15

Theory

1. Chemistry of
   a) Carbohydrates including peptidoglycan
   b) Fat
   c) Proteins& Amino acid
2. Water & Fat soluble Vitamin, Plasma protein.
3. Enzymes (Classification, factors regulating, institution 2 clinical application)
4. Buffers, Molarity, indicators, Radioisotopes, Radiation hazard, RSA.
5. Overview of Iron, Calcium, Iodine, Flourine.
6. Overview of Nucleic Acids & Uric Acid.

Practical

1. Laboratory safety, Glass ware cleaning.
2. Pipettes, record maintenance.
3. Tests for Carbohydrate.
4. Tests forProteins &Amino Acids.
5. Tests for Iron, Calcium, Iodine, Flourine, etc
6. Physiological Urine.

PART-3 (FINAL DMLT)

PAPER	SUBJECT	MARKS	TOTAL MARKS	DURATION
PAPER-I	PATHOLOGY			
	THEORY -	100	150	10 MONTHS
	HISTOTECHNOLOGY			
	CYTOLOGY			
	MUSEUM STUDY			
	ORAL	30		
	PRACTICAL	20		
PAPER-II	MICROBIOLOGY			
	THEORY	100	150	10MONTHS
	IMMUNOLOGY			
	SEROLOGY			
	PARASITOLOGY			
	VIROLOGY			
	ANIMAL CARE			
	PRACTICAL	30		
	ORAL	20		
PAPER-III	BIOCHEMISTRY			
	THEORY	60	100	10 MONTHS
	1. Glucose Homeostasis, overview DM, HGAIC.			
	2. Lipoprotein & Hyper Lipoprotein.			
	3. Liver function test.			
	4. Renal function test.			
	5. Thyroid function test.			
	6. Alimentary function test.			
	7. Water & Electrolytic Balance.			
	PRACTICAL	25		
	ORAL	15		

NB. SECOND SEMESTER EXAMINATION WILL BE CONDUCTED TEN MONTHS AFTERFIRST SEMESTER EXMINATION.TOTAL MARKS- 400.

THE FINAL EXMINATION WILL BE CONDUCTED TEN MONTHS AFTER SECOND SEMESTER. TOTAL MARKS FOR WHICH WILL BE 400.

PART-3 (FINAL DMLT) -details

FINAL PAPER –I PATHOLOGY

Total Marks: 150 Theory -100, Practical-30, Oral-20

HISTOTECHNOLOGY, CYTOLOGY, MUSEUM STUDY

Introduction, Cell, Tissue and their function.,Methods of examination of tissues and cells, Fixation of tissue: Classification of fixatives., Simple Fixatives and their properties. , Tissue processing : , Collection of specimen, Labeling and fixation , Dehydration , Clearing , Impregnation , Embedding, Paraffin blockmaking , Section Cutting: , Microtomes and microtome knives – sharpening of knife, Microtome use – Honing, Stropping, Techniques of section cutting , Mounting of sections., Frozen section.

(a) Staining :, Dyes and their properties , Theory of staining , Staining technique with haematoxylin and eosin. , Mounting of actions , Common special stains – , Routine H & E, Meason Trichrome , Men – Geison , Reticulin , PAS, Fe, Lipid, Mucicamine , Vencos for calcium , Special staining , Decalcification : , Fixation , Decalcification , Detection of end point, Neutralization and processing.

(a) Exfoliative Cytology and Fine needle aspiration cytology : , Types of specimens and preservation. , Preparation and fixation of smears. , Papanicolaous staining technique/MCC staining/HE staining/. , Sex chromatin staining. , Nuscum Techniques. , Reception of specimen., Preparation of fixation , Preservation , Presentation

AUTOPSY TECHNIQUE: Assisting in autopsy, Preservation of organs and ,Processing of the tissue.

1. Waste disposal and safety in laboratory.

ORAL AND PRACTICAL **MARKS-30+20**

Histotechnology and Cytology ,Fixation, processing, embedding and section and , reparation of slides., Sharpending of the knife. , Preparation of fixatives and , , decalcifying fluid. , Preparation of adhesives to fix the section to the slide. , Preparation and fixation of cytology smears and ,Papanicolaoue's staining techniques., MOG staining /HE staining. , Mounting .

FINAL PAPER-II MICROBIOLOGY

Total Marks: 150 Theory -100, Practical-30, Oral-20

IMMUNOLOGY AND SEROLOGY

Emphasis on principal and uses/application ,Immunity –Basic principles and classification, Antigen, Antibody (Immunoglobulin's), Complement system, Antigen – Antibody reactions, Hypersensitivity- classification & different skin tests used for diagnosis., Immunodeficiency diseases including AIDS –in brief, Autoimmunity – Basic concept, Immuno-prophylaxis & Immunization schedule, Vaccines-classification & uses.

PARASITOLOGY

- Introduction & classification of medically important parasites, Intestinal & Tissue protozoa (E.histolylica, Giardia Primary Amoebic meningo-encephalitis)
- Malaria parasite, Leishmanial parasites, Tapeworms, Flukes of liver and , Intestine, Intestinal nematodes, Filarial worms and other tissue nematodes

VIROLOGY

- General Characters of viruses, Classification in brief and name of the diseases they produce., Hepatitis viruses, HIV, (Polio, Rabies, Rata, Measles, Dengue)
- Oncogenic viruses in brief, Collection and transport of virological specimens
- Laboratory diagnosis of viral infections (various methods of virus culture, serology etc.)

ANIMAL CARE

- Care of sheep and procedure to draw blood from sheep.,Handling, feeding and Breeding of laboratory animals.

Practical & Oral Marks-30+20

(Serology + Parasitology + Virology + Animal Care)

Parasitology

Collection, transportation, preservation of faecalmatereials for examination of parasites.

a) Saline and lodine preparation of faeces for identification of Ova Cysts, RBC, Puscells, Macrophage bacterial and fungal study

b) Concentration techniques for examination of faeces.

Blood smear examination for malaria parasite L.D. bodies, micro filarial etc.

Virology - (all theory discussion), Embryonated egg inoculation, Tissue culture techniques

- Serological tests for diagnosis of common viral diseases, HIV surveillance lab and EUSA / Rapid tests.

Serology -Widal test and preparation of Salmonella antigens, VDRI Test, Latest agglutination tests for (RA, CRP, ASO, Pregnancy Test, Australia Antigen, Toxoplasmosis)
ELISA test RIA Test, Get diffusion techniques and ,Immuno electro phoresis, Detection of Antigen / Antibody for Malarial (ICT), Optimal Test, Assay of immunoglobulins

Diagnostic skin tests

- Tuberculin test (montoux test), Lepromin test, Casoni's test, Other tests.

FINAL PAPER-III BIOCHEMISTRY

Total Marks: 100 Theory -60, Practical-25, Oral-15

CLINICAL BIOCHEMISTRY

SECTION-A

ORGAN FUNCTION TESTS

1. Endocrine Function Testes – Thyroid Function Tests- 2
2. Biochemical tests of CSF- 12
3. Renal FunctionTests- 3
   24 hr collection, preservation
   Physical characteristics, clearance tests.
4. Liver function tests.- 3
5. Gastric Function Tests-1
6. Pancreatic Function Tests-2
   Serum Amylase, Serum Trypsin, Serum Lipase,.

SECTION-B

CLINICAL ENZYMOLOGY & ORGANIZATION

Fundamentals of analytical bio-chemistry and instrumentation.

1. Clinical enzymology – Diagnostic enzymes, Iso-zymes.
2. Fundamentals of Analytical Bio-chemistry & Instrumentation

- Analytical balance
- Centrifuges
- Colorimeter and spectrophotometer
- Flame photometer
- Auto analyzers
- Chromatography
- Electrophoresis

ORAL AND PRACTICAL

List of Practical's in Clinical Bio-chemistry

Determination in Blood/Serum of

- Glucose Tolerance Tests
- Urea

- Creatinine
- Uric Acid
- Cholesterol, Triglycerides, HDL Cholesterol, Lipid Profile
- Total serum protein and albumin
- $T_{3,}$ T_4, TSH