

**Curriculum of**  
**Diploma in Medical Laboratory Technology**

**D.M.L.T**

**Revised: June 2011**

**Board of Studies (paraclinical) Faculty of Medicine**  
**SARDAR PATEL UNIVERSITY Vallabh Vidyanagar 388120 (Gujarat)**

**Curriculum of**  
**DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY (DMLT)**

**JUNE-2011**

**RDMLT-1** : A Candidate for admission to the Diploma in Medical Laboratory Technology(DMLT) must have passed the B Sc. Degree Examination of the Sardar Patel University with Medical Laboratory Technology(or Medical Technology in clinical Laboratory Technology) / Microbiology/ Bio Chemistry/ Zoology / Botany/ Chemistry / Bio- Technology / Environment Science / Genetics / Bioinformatics / B. Sc. (Home Science) (Food and Nutrition) / B. Sc (Home Science) (Food Science and Quality Control) (Vocational) or B. Sc (Industrial Microbiology) (Vocational) as principal subject or an examination of any other university recognized as equivalent thereto and must have:

**RDMLT-2** : The course of study for the Diploma in Medical Laboratory Technology shall be a full time course and its duration shall be of one academic year.

**RDMLT-3** : A candidate who has passed an equivalent examining body and is seeking admission to the Institute recognised by this University shall not be admitted without producing an eligibility certificate from the Sardar Patel University.

**RDMLT-4** : To become eligible to appear in the final examination conducted by Sardar Patel University -

a) a candidate has to keep two terms at the Institute recognised for teaching the course of studies in Medical Laboratory Technology by the university.

b) a candidate has to keep the minimum attendance of 75% in Theory and Practicals separately.

c) a candidate has to obtain at least 30% marks in aggregate of all the papers in the internal tests conducted by the Institute.

**RDMLT-5** : A candidate desirous of appearing at the Examination for the Diploma in Medical Laboratory Technology must forward his application in the prescribed form accompanied by a Certificate of attendance to the Registrar through the Head of the institute on or before the date prescribed for the purpose under the ordinance/s.

**RDMLT-6** : For the purpose of deciding final result at this examination, the ratio between the Internal assessment and final University examination shall be 20:80 for both theory &

practicals. For the purpose of internal assessment the Institute will conduct at least one test in each term.

**RDMLT-7** : The final examination for the Diploma in Medical Laboratory Technology shall be held at the end of the academic year.

**RDMLT-8** : The Diploma Medical Laboratory Technology shall not be conferred upon a candidate unless he/she has passed in all the subject of the theory examination and the practicals in accordance with the provisions of relevant regulations.

**RDMLT-9** : The subject of examination for the Diploma Medical Laboratory Technology will be as under.

**DMLT-Examination System and Marks distribution: Theory and Practical**

Course Code	Subject	Duration of Examination (hours)	Distribution of marks		Total
			University exam	Internal assessment	
DMLT-101	Clinical Biochemistry	3 hours	80	20	100
DMLT-102	Medical Microbiology	3 hours	80	20	100
DMLT-103	Clinical Pathology & Blood Banking	3 hours	80	20	100
DMLT-104	Hematology & Histopathology	3 hours	80	20	100
DMLT-105 (P)	Practicals and Oral	3 days*	240**	60**	300
	<b>Total</b>		<b>560</b>	<b>140</b>	<b>700</b>

\* One day for each of Pathology, Microbiology & Biochemistry practical per batch

\*\* Internal : 20 marks and External: 80 marks for each of Pathology, Microbiology and Biochemistry Practical

**RDMLT-10 : STANDARD OF PASSING: (As per DMLT Rules of June 2001)**

(A) To pass the Diploma in Medical Laboratory Technology Examination, a candidate must obtain at least 45% marks in each paper/practical/oral at the University Examination as also in the total of the internal assessment and the University Examination.

(B)AWARD OF CLASS:

(1)The successful candidates who obtain at least 50% or more but less than

60% marks in the total of Internal assessment & the University examination will be place in Second Class.

(2)The successful candidates who obtain at least 60% or more but less than

70% marks in the total of Internal assessment & the University examination will be place in First Class.

(3)The successful candidates who obtain at least 70% or more marks in the total of Internal assessment & the University examination will be declared to have passed the examination in First Class with Distinction.

Exemption:

A candidates failing the examination but securing 45% marks in a paper/practical may at his option be exempted from appearing again in that subject at the subsequent examination and will be declared to have passed the examination when he passes in all the remaining papers/practicals in accordance with the provisions of (i) above A candidates who has refused once to avail himself of the exemption earned by him in any paper/practical can not claim it on a subsequent occasion.

Candidates passing the examination in compartments in the manner herein

provided for, shall not be eligible for a scholarship awarded at the examination or for the award of a class.

## **Detailed Syllabus**

### **DMLT**

#### **PAPER I: CLINICAL BIOCHEMISTRY UNIT:1 Introduction & General aspects**

- Introduction to Clinical Biochemistry
- Study of weights, volumes and Units, Inter-conversion of units, Measurements, Preparation of solution, Normal range
- Different anticoagulants used in Clinical Biochemistry, its application and Mechanism of action.
- Hazards in the Laboratory.

#### **UNIT:2 Instrumentation**

- Automation in Clinical Biochemistry laboratory
- Electrophoresis, Chromatography, Colorimeter, Spectrophotometer, ELISA, RIA, Flame photometer

#### **UNIT:3 General Biochemistry of Carbohydrates**

- Classification, Biomedical importance, properties (chemical & physical)
- Carbohydrate Metabolism (In brief) : Glycolysis, TCA, HMP shunt, Regulation of blood sugar, GTT, Diabetes

#### **UNIT:4 General Biochemistry of Proteins**

- Amino acids, Peptides, Classification & Properties of Plasma proteins, Immunoglobulins,
- Protein metabolism : Transamination, Deamination, Urea cycle, Phenyl ketonuria, Alkaptonuria.

#### **UNIT:5 General Biochemistry of Lipids**

- Lipids: Definition, Classification, Properties, Phospholipids.
- Lipid metabolism : Cholesterol, Lipoproteins, VLDL, LDL, HDL, Atherosclerosis, Ketosis, Lipid Profile

#### **UNIT:6 Nucleic acids**

Nucleotides : Nucleic acids, Functions (In Brief), Purine catabolism, Uric acid: Formation, Estimation, Interpretation, Gout

## **UNIT:7 Hemoglobin**

- Hemoglobin structure, Hbs, Thalassemia
- Hemoglobin : Synthesis (In brief) Porphyrins, Heme breakdown, Bilirubin, Jaundice, Lab. diagnosis

## **UNIT:8 Enzymes**

- Enzymes : Definition, Classification, Factors affecting enzyme activity, Inhibition, Diagnostic use of Enzyme

## **UNIT:9 Minerals & Vitamins**

- Minerals : Calcium, Iron, Phosphorus, Iodine, Sodium & Potassium.
- Vitamins (In brief) : A,D,E, K,B12,Folic acid & Vitamin C (In brief)

## **UNIT:10 Function Test**

Liver Function tests: Introduction, function of liver, type of investigations carried out, normal range and interpretation of results

Renal function tests: Functions of kidneys, Various renal function tests including clearance tests and interpretation of results.

Thyroid function tests: Estimation of T-3, T-4, TSH, Interpretation of results. pH, Blood buffers, Acid-base balance, Anionic gap

Quality Control: Internal and External

### **Nice To Know:**

## **UNIT:11 Nutrition**

Principles of nutrition, Balance diet, BMR. Kwashiorkor and marasmus

## **UNIT:12 Molecular biology**

Molecular biology (In brief) : Replication, transcription, DNA recombinant technology, Blot techniques, PCR

## **PAPER II: GENERAL & CLINICAL MICROBIOLOGY**

### ***MUST KNOW:***

#### **UNIT 1: HISTORY & CLASSIFICATION**

History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Robert Koch (Koch's Postulates)

Bacterial Taxonomy: Nomenclature and classification of microbes (in brief)

#### **UNIT 2: MORPHOLOGY**

Microscopy, Stained preparation, Size & Shape

Morphology of bacteria: Structures of a bacterial cell and their functions

Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements

#### **UNIT 3: GENERAL MICROBIOLOGY**

Sterilization and disinfection

Culture media

Culture methods

Identification of Bacteria: biochemical tests

Antibiotic sensitivity testing

#### **UNIT 4: IMMUNOLOGY**

Immunology

Infection, Immunity, Antigen, Antibody,

Antigen-Antibody reactions (General features, Precipitation, Agglutination, Complement fixation test,

Immunofluorescence, Radio Immunoassay, ELISA),

Complement system,

Hypersensitivity

#### **UNIT 5: SYSTEMIC MICROBIOLOGY**

Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteria, Clostridia,

Coliforms, Proteus, Salmonella, Shigella, Vibrio, Pseudomonas, Haemophilus, *Mycobacteria*,

*Spirochaetes*

#### **UNIT 6: MYCOLOGY**

Morphological Classification of fungi

Laboratory diagnosis of Fungal Infections

## **UNIT 7: PARASITOLOGY**

**Morphology, life cycle, laboratory diagnosis of following parasites:**

### **Protozoa:**

*Entamoeba, Giardia, Trichomonas, Leishmania, Plasmodium*

### **Helminthology**

#### **Cestodes:**

*Taenia, Echinococcus*

#### **Nematodes:**

*Trichuris, Ancylostoma,*

*Ascaris, Enterobius, Wuchereria bancrofti(filaria)*

## **UNIT 8: VIROLOGY**

General Properties of Virus: Morphology, Replication & cultivation of viruses

- Disease caused, Laboratory diagnosis & prevention of
- Hepatitis viruses
- HIV

## **UNIT 9: CLINICAL / APPLIED MICROBIOLOGY**

- Collection, Transportation & Culture of
- Sputum and other respiratory specimens
- Urine
- Faeces
- Blood
- CSF and other body fluids
- Hospital-acquired infections & Laboratory Hazards
- Disposal of Biomedical waste
- Quality control in Diagnostic Microbiology
- Automation in Diagnostic Microbiology

## **Paper – III: Clinical Pathology & Blood Banking**

### **Clinical Pathology**

#### ***MUST KNOW***

- Urine Examination: Physical, Chemical and Microscopic
- Stool examination : Gross, chemical & microscopic
- CSF Examination
- Semen examination

#### ***NICE TO KNOW***

- Sex chromatin determination.
- Other body fluids examination
- Quality control in Clinical Pathology

### **Blood Banking**

#### ***MUST KNOW***

- Immunohematology of red cell and blood group systems
- Apparatus used in blood banking, its care and cleaning
- Record keeping
- Methods of ABO and Rh blood grouping
- Screening of a blood donor, tapping of blood donor
- Cross matching tests
- Storage of blood
- Coomb's test
- Blood component therapy

#### ***NICE TO KNOW***

- Antibody titrations
- Blood transfusion reactions
- Quality control in Blood Banking

## **Paper – IV: Hematology & Histopathology**

### **Hematology**

#### ***MUST KNOW***

- Vein puncture
- Instruments used in hematology
- Common anticoagulants and their use
- Composition of blood cellular elements, functions of blood
- Estimation of Hemoglobin
- Methods and counting of red blood cells, white blood cells, platelets and reticulocytes.
- Estimation of erythrocyte sedimentation rate, packed cell volume, blood indices
- Preparation of blood films, staining methods and preparation of different stains and diluting fluids
- Study of blood smear examination for red blood cells, different white blood cells, normal and abnormal cells, platelets, and parasites.
- Studies for blood coagulation and haemostasis
- Sickling tests, red cell fragility test and LE cell test. Foetal Hemoglobin Estimation and Hemoglobin electrophoresis.
- Basics of automated Blood Cell counters

#### ***NICE TO KNOW***

- Quality control in Hematology
- Bone Marrow Examination
- Laboratory diagnosis approach on Anemias, Leukemias, and Bleeding disorders.

# Unit: 2. Histopathology/Cytology

## MUST KNOW

- introduction to Histology
- Handling Biopsy Specimen
- Instruments in Histopathology
- Fixation & common fixatives
- Tissue processing: dehydration, clearing, embedding, methods of tissue processing: automated & manual, Preparation of block.
- The manipulation and use of microtomes, Microtome knives and methods of sharpening. Paraffin block, section cutting, picking up sections, drying sections,
- Staining : principle of staining, preparation and use of Hematoxyline and eosin stain.
- Mounting,
- Frozen section apparatus: a theoretical knowledge of its application, construction and use.
- Diagnostic Cytology: preparation of smears and Papanicolaou stain.

## NICE TO KNOW

1. Quality control in Histopathology
- Methods in common use for decalcification
  - recognition and correction of faults in section cutting
  - Preservation of slides and blocks

## **List of Practicals/skills**

### **1.Pathology:**

Students should be able to perform:

#### **Haematology :**

1. Microscopy
2. Collection of Blood
3. Preparation of bulbs for collection
4. Blood cell counter
5. Estimation of Hemoglobin
6. RBC count
7. PCV & RBC indices
8. Platelet count
9. Total WBC count
10. Differential count
11. Peripheral smear
12. Reticulocyte count
13. ESR
14. Sickling tests
15. Bleeding time & Clotting time

#### **Clinical Pathology**

1. Urine Exam. R & M
2. Stool R & M
3. Semen examination R & M
4. CSF Exam. R & M

#### **Blood Banking**

1. Blood Group
2. CM Tests
3. Du Tests
4. Comb's Tests,
5. Antibody Tests

#### **Histopathology & cytology**

##### ***Must acquire***

1. Preparation of fixatives
2. Haematoxylin and eosin

##### ***Nice to acquire:***

1. Logging of tissue processing
2. Paraffin embedding
3. Section cutting
4. Staining
5. Mounting
6. Pap Stain.

## **2. Biochemistry:**

Students should be able to perform:

### ***Must acquire***

1. Preparation of standard solution, molar solution and other reagents
2. analysis of normal and abnormal urine
3. Estimation of blood /serum glucose by various methods
4. GTT
5. Estimation of total protein and A/G ratio
6. Electrophoresis of plasma proteins
7. Electrophoresis of lipoproteins
8. Estimation of total cholesterol and its fractions
9. Estimation of calcium
10. Estimation of phosphorous
11. Estimation of Creatinine
12. Estimation of urea
13. Estimation of uric acid
14. Estimation of AST
15. Estimation of ALT
16. Estimation of alkaline phosphatase
17. Estimation of Bilirubin , direct , total
18. Auto analyzers
19. Electrolyte analyzer
20. Arterial blood gas analyzer
21. Chemiluminance equipment
22. Spectrophotometer

### ***Nice to acquire:***

1. Estimation of iron and TIBC
2. Chromatography

## **3. Microbiology:**

Students should be able to perform:

### **Bacteriology**

#### ***Must acquire***

1. Aseptic practices in laboratory and safety precautions.
2. Preparation and pouring of media – Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Serum sugars, TSI, Sabouraud dextrose.
3. Operation of autoclave, hot air oven, distillation plant, filters like Sietz and membrane and sterility tests.
4. Washing and sterilization of glassware (Plugging and packing)
5. Disposal of contaminated materials like cultures.
6. Quality control of media, reagents etc.
7. Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators, etc.
8. Performance of antimicrobial susceptibility testing e.g. Kirby-Bauer,

9. Collection of specimens for Microbiological investigations such as Blood, Urine, Pus (Swabs),
10. Identification of Bacteria of Medical Importance upto species level
11. Preparation of stains viz. Gram, Ziehl Neelsen (ZN) etc. and performing of staining.
12. Care and operation of Microscopes viz. Light and Fluorescent microscopes.
13. Preparation, examination, and interpretation of direct smears from clinical specimens, viz. Sputum for AFB: ZN, Slit smears for *M. leprae* by modified ZN staining,
14. Quantitative analysis of urine by pour plate method and semi-quantitative analysis by standard loop test for finding significant bacteruria.
15. Plating of clinical specimens on media for isolation, purification, identification and quantitation purposes.
16. Methods for the preservation of bacteria, Maintenance of stock cultures.
17. Tests for motility: hanging drop preparation

***Nice to acquire:***

1. Techniques of anaerobiosis, anaerobic jars, evacuation and filling with CO<sub>2</sub> and H<sub>2</sub>.
2. Preparation of stains viz., capsules, spores etc. and performing of staining.
3. Skin tests like Mantoux.
4. Special tests-Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for mycobacterium, satellitism, CAMP test, catalase, slide agglutination tests.
5. Culture and Antimicrobial susceptibility tests for mycobacteria.

**Immunology**

***Must acquire :***

1. Collection of blood by venipuncture, separation of serum and preservation of serum for short and long periods.
2. Performance of serological tests viz. Widal, VDRL/RPR
3. Enzyme linked immunosorbant assay: HIV, HBsAg, HCV
4. Latex agglutination tests: RA, CRP,
5. Rapid tests (Immunochromatography or Flow through type) HIV .

***Nice to acquire:***

1. Performance of serological tests viz. Brucella tube agglutination, Weil-Felix, cold agglutination, indirect haemagglutination, Paul-Bunnell, Rose-Waaler, IFA.

**Mycology**

***Must acquire***

1. Direct Examination of specimens by KOH, Gram, Kinyoun's, Giemsa, Lactophenol Cotton Blue stains.

**Parasitology:**

***Must acquire***

1. Performance of stains – Leishman, Giemsa.
2. Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (Salt flotation and Formol-Ether methods).

3. Examination of blood for protozoa and helminths by wet mount, thin and thick stained smears.

***Nice to acquire:***

1. Identification of common arthropods and other vectors viz., Mosquito, sand-fly, Ticks, Mite, Cyclops.
2. Collection of specimens.
3. Preservation of parasites-mounting, fixing, staining, etc.
4. Serodiagnosis of parasitic infection.

**Virology:**

***Must acquire***

- Serological tests – ELISA for HIV, HBsAg, HCV

***Nice to acquire:***

RPHA for HBsAg, Haemagglutination Inhibition for Influenza, and Haemadsorbition for parainfluenza.

Chick Embryo techniques – inoculation and harvesting.

**SUGGESTED BOOKS :**

- Dr. Praful B. Godkar, Text Books of Medical Laboratory Technology
- Anathanarayana & Panikar – A Text Book of Medical Microbiology
- P. Chakraborty- A Text Book of Parasitology
- Vasudevan & Shreekumar : Biochemistry for Medical students
- Dacie, Practical Haematology
- K.Laxminarayan : Histological techniques
- Dr. Mukherjee, Medical Laboratory Technology, Volume I , II & II
- Silvertone : Introduction to Medical Lab. Technology
- Manual for Clinical Pathology by Sabitry Sanyal
- Harper's Biochemistry