

Bhakta Kavi Narsinh Mehta University Junagadh



CURRICULUM FOR

D.M.L.T.

[Diploma in Medical Laboratory Technology]
(One Year Post Graduate Diploma Course)

Effective from June – 2016

① ### GENERAL INTRODUCTORY LECTURES ###

1. Introduction to medical technology i.e.
 - * What it entails.
 - * Origin.
 - * Progress till today.
 - * Scope for future.
2. General laboratory techniques & apparatus.
 - * Centrifuge.
 - * Autoclave.
 - * Oven.
 - * Water bath.
 - * Inspissator.
 - * Incubator.
 - * Refrigerator.
 - * Simple & Analytical Balance.
 - * colorimeter & Spectrophotometer.
 - * Microscope.
 - * PH Meter.
3. Quality control.
 - * Standard deviation & selection of abnormal individual.
 - * importance of quality control serum pool.
 - * Case Histories.
4. Laboratory glassware and cleaning.
 - * Pipettes, capillaries, test tubes, slides, pasteur pipette, micropipettes etc.
5. Preparation of stain & proper staining techniques, methods of transmission of various specimen and material for laboratory examination.

② ### HAEMATOLOGY ###

1. Methods of blood collection.
 - * Capillary and venous blood.
 - * Anatomy of veins from the elbow region.
 - * Complications of vein puncture.
 - * Talk on arterial blood collection.

DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

Ordinance & Regulations relating to the examination leading to the Diploma of M.L.T.

O:D.M.L.T. 1 :

A candidate eligible for this degree of D M L T must have passed Bachelor of Science of this University with subjects as Biochemistry or Microbiology & should have obtained minimum 45% of marks. Candidate should have also passed the entrance test for this course.

Out of the total seats 60% seats are reserved for candidates passed with Bachelor of Science with Biochemistry & 40% seats for candidates passed Bachelor of Science with Microbiology.

O:D.M.L.T. 2:

No candidate shall be admitted to the D M L T course unless he has passed the Bachelor of Science Examination with Biochemistry or Microbiology as a main subject.

O:D.M.L.T. 3 :

The students must submit their applications for the examinations to the Registrar on or before the prescribed date with two terms granted.

O:D.M.L.T. 4:

No candidate shall be admitted to the D M L T examination unless he has 80% attendance in Theory & Practicals.

R:D.M.L.T. 1 :

The following are the papers prescribed for the two terms of the D. M. L. T Examination.

SR. NO.	PAPER NO.	MARKS Theory	names practical
			TEACHING PERIOD PER WEEK
1.	2.	3.	4.
1.	PAPER NO.1 General introduction, Biochemistry	100	100
	Practicals for Paper 1	100	

2.

3.

4.

PAPER NO. II

Haematology, Immunohaematology & Blood Banking. 100 4

Practicals for Paper II 100 8

3. PAPER NO. III

GENERAL Microbiology, Medical Microbiology, Serology & Histopathology. 100 4

Practicals for Paper III 100 8

4. PAPER NO. IV

Urine Analysis, Examination of Body fluids, seminal fluids, Sputum, General Parasitology. 100 4

Practicals for paper No. IV 100 8

R:D.M.L.T. 1A :

The duration of the Examination shall be as under :-

SR. NO.	PAPER	No. of Theory Papers.	Durations Theory, Practicals	No. of days
1.	2.	3.	4.	5.
1.	Paper-I	1	3 hours 7 hours	1
2.	Paper -II	1	3 hours 7 hours	1
3.	Paper -III	1	3 hours 7 hours	1
4.	Paper -IV	1	3 hours 7 hours	1

R:D.M.L.T. 2 :

The following is the syllabus for the two terms of D.M.L.T. Examination.

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Bhakta Kavi Narsinh Mehta University

Govt. Polytechnic Campus, Bilkha Road, Khadiya

Junagadh, Gujarat (India)-362 263

Ph.(0)0285-2681400 / Fax : 0285-2681503

Website : <http://www.bknmu.edu.in> Email : info@bknmu.edu.in

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2. Anticoagulants - their uses & reasons for choice.
3. Preparation & examination of thin, thick and wet blood films.
4. Physiology of blood formation & destruction of,
 - * Erythrocyte,
 - * Leucocyte,
 - * Thrombocyte.
 - * Haemoglobin.
5. Ultrastructure of blood cells & its precursor.
6. Role of 2,3 (DPG) Diphosphoglycerate in regulation of erythrocyte production.
7. Theory & estimation of,
 - * RBC count.
 - * WBC count.
 - * Differential count.
 - * Packed Cell volume.
 - * Erythrocyte sedimentation rate.
 - * Haemoglobin.
 - * Red cell indices.
 - * Eosinophil count.
 - * Reticulocyte.
8. Talk on technique of marrow aspiration biopsy (E test).
9. Significance of each WBC.
10. Haematological diseases like
 - * Lupus erythematosus.
 - * Infection mononucleosis.
 - * Paroxysmal nocturnal haematuria.
 - * Diagnostic tests for above diseases.
11. Anaemias.
 - * Acute.
 - * Chronic.
 - * Iron deficiency anaemia.
 - * Vit B12 & folate deficiency anaemia.
 - * Aplastic anaemia.
 - * Sideroblastic anaemia.
 - * Hemolytic anaemia.
 - * Refractory anaemia.

12. Leukemias.

* Acute & chronic (Lymphocytic, Monocytic & Myelocytic).

* Cytochemistry method to identify type of leukemias.

* Hodgkin's Lymphomas & nonHodgkin's disease.

* Multiple myeloma.

* Waldenstrom's macroglobulinemia.

* Leukemoid reactions.

13. Haemoglobin electrophoresis & haemoglobinopathies.

* Normal & abnormal haemoglobins with nomenclatures.

* Abnormal Haemoglobin syndromes.

o Thalassemias : Different types - B-thalassemias (Major & Minor).

o B-Thalassemia in association with B-haemoglobinopathies (doubly heterozygous states).

o Thalassemia.

o Laboratory studies in thalassemias and screening test.

* Sickle cell disease.

o Complications.

o Sickle cell trait.

* Haemoglobin.

o Haemoglobin C diseases.

o Haemoglobin C trait.

o Haemoglobin D diseases and trait.

o Doubly heterozygous states : SC, SD disease.

* Laboratory studies in haemoglobinopathies.

o Osmotic fragility.

o sickling test.

o Dithionite tube test.

✓ Alkali denaturation test for Hb F.

o Electrophoresis of Hb.

14. Glucose & phosphate dehydrogenase deficiency disease (G6PD).

* Cause and diagnosis.

15 CPAGULATION.

- * Intrinsic and extrinsic coagulation system and blood platelets.
- * 13 coagulation factors.
 - 0 Description, properties, significance & disease associated.
- * vascular hemophilia.
- * Disseminated intravascular coagulation.
- * Procedures to find deficiency of factors.
 - 0 Prothrombin time.
 - 0 Bleeding time - Duke and Ivy method.
 - 0 Whole blood clotting time.
 - 0 Clot retraction.
 - 0 Fibrinogen determination.
 - 0 Platelet count.
 - 0 Partial thromboplastin time.
 - 0 Tourniquet test.

16 Blood Parasites.

- * Recognition of malaria and microfilaria parasites.
- * Recognition of Principal blood pictures.

17. Automation.

- * Coulter counter.
- * Particle counter.

IMMUNOHAEMATOLOGY

1. Hetero Immune disease.
2. Iso Immune disease.
3. Hemolytic disease of the new born.
4. Auto Immune disease.
5. Complete and Incomplete antibodies.

③ URINE ANALYSIS

1. Composition of Urine.
2. Examination of Urine.
 - * Physical, Chemical and microscopic examination of urine.
3. Common renal diseases.
4. Urinary Calculi.

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EXAMINATION OF FAECES

1. Methods of collection, Physical, chemical & microscopic Examination.
 - 0 Protozoa : Trophozoites & cysts.
 - 0 Helminths : Concentration methods for ova/cyst.

GENERAL PARASITOLOGY

1. General introduction, Host-Parasite relationship.
 - * Protozoology & Helminthology : Introduction, classification and importance.
 - 0 Protozoology : E. histolytica, E. coli, Intestinal oral and genital flagellates, B. coli.
 - 0 Helminths :
 - Cestodes : T. saginata, T. Solium, E. granulosus H. nana.
 - Trematodes : A. Lumbricoides, Necator americanus, Ancylostome duodenale, T. trichocephala, E. vermicularia, W. bancrofti & B. Malayi (microfilaria).
 - D. Medinensis.

History, geographic distribution, Habitat, morphology and life cycle, pathological effects and laboratory diagnosis of above parasites.

|||| SEROLOGY ||||

1. General principles, Serological methods.
 - * Agglutination test.
 - * Precipitating test.
 - * Flocculation.
 - Complement fixation test fluorescent antibody method.
 - * Serodiagnostic tests for,
 - 0 Syphilis.
 - 0 Widal test.
 - 0 Lg G, Lg M, Lg A antibodies.
 - 0 C-Reactive protein.
 - 0 Hepatitis associated antigen.
 - 0 Rheumatoid factor.
 - 0 Antinuclear antibody.
 - 0 Antistreptolysin O titre.
 - 0 ELISA.

1. Cerebrospinal Fluid.

- * Anatomy and Physiology of meninges.
- * Procedure of Lumber puncture and collection.
- * Physical, chemical and microscopic examination.

2. Aspirated fluid,

- * Difference of transudates & exudates.
- * Mode of formation.
- * Methods of collection;
- * Physical : General appearance, specific gravity etc.
- * Chemical : Pandy's test, Proteins.
- * Microscopic examination : Unstained & stained cells and bacteria, cells count etc.

3. Gastric fluid.

- * Anatomy and Physiology of stomach.
- * Various gastric stimulants and test meals.
- * Gastric intubation and collection of gastric juice.
- * Physical and chemical examination.
- * Abnormalities in gastric secretion in various diseases.

||||| EXAMINATION OF SEMINAL FLUIDS |||||

1. Physiology.
2. Collection.
3. Gross examination.
4. Microscopic examination of seminal fluids.

||||| THE SPUTUM |||||

1. Anatomy and physiology of respiratory system.
2. Method and precaution in collection of sputum.
3. Physical examination.
4. Microscopic examination.
5. Concentration method for ABB finding in various diseases.

||| BIOCHEMISTRY |||

1. Nitrogenous Compounds.

- * Proteins and amino acids.
- o Classification, metabolism & nitrogen balance.

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* Analytical techniques for protein determination.

- 0 N analysis.
- 0 Biuret Reaction.
- 0 Phenol method.
- 0 Ionic Precipitation.
- 0 Dye binding.
- 0 Anionic & cationic precipitation.
- 0 Salting out technique.
- 0 Fibrinogen.
- 0 Total precipitation and albumin.

* Plasma Proteins.

- 0 Functions.
- 0 Properties.
- 0 Clinicopathologic correlations and diseases associated.
- 0 Electrophoretic patterns.
- 0 M - components.
- 0 Hypogamma and Agammaglobulinemia.
- 0 Polyclonal and monoclonal gammopathy.
- 0 Bence Jones Proteins in urine & serum.
- 0 Cryoglobulins.

2. Non protein nitrogenous compounds.

- * Urea.
- * Creatine.
- * Uric acid.

Biochemistry, Clinicopathologic correlations and methods of estimation of each.

3. Carbohydrates.

- * Classification.
- * Glucose.

- 0 Metabolism.
- 0 Digestion and absorption.
- 0 Hepatic and Extrahepatic contributions.
- 0 Intracellular metabolism of glucose.
- 0 Glucose tolerance curve.
- 0 Clinicopathologic correlations.
 - = Diabetes mellitus as a disease.
 - = Screening test = Urine glucose, Fasting blood glucose, Two hours post prandial.
 - = Diagnostic test = Glucose tolerance curve.

- o Management of diabetic patients.
- o Hypoglycemia.
- * Methods of estimation of glucose.
 - o Polin - Wu method.
 - o Nelson - Somogye's method.
 - o O-Toluidine method.
 - o GOD - POD method.
 - o Hexokinase method.
- 4. Lipids.
 - * Biochemistry and Classification.
 - * Chemical reactions of lipids and metabolism.
 - * Hepatic rôle in lipid metabolism.
 - * Fatty liver.
 - * Triglyceride metabolism and estimation.
 - * Cholesterol metabolism, cholesterol assays.
 - * Blood lipids.
 - * Lipoproteins, abnormal lipoproteins.
 - * Clinical pathologic correlations.
- 5. Anatomy, Physiology & chemistry of liver function tests.
 - * Bilirubin metabolism, Classification of jaundice, estimation of direct & indirect bilirubin.
 - * Metabolic tests.
 - o Glucose tolerance, fructose tolerance, epinephrine tolerance, cholesterol estimation; estimation of bile acids, serum protein levels.
 - * Flocculation tests.
 - o Blood ammonia determination.
 - * Foreign substance excretion.
 - o Rose Bengal excretion.
 - o Sulobrompthdein excretion.
 - * Thymol turbidity, Alkaline Phosphatase, Acid Phosphatase, SGPT estimation.
- 6. Anatomy, Physiology and Chemistry of kidney function test.
 - * Tubular function.
 - * Principles of renal clearance.
 - * Urea and creatinine clearance methods.
 - * PSP excretion test.
 - * Concentration test.

7. Heart Enzymes.

- * SGOT, LDH, CPK and their estimation.

8. Electrolytes & blood gases.

- * Sodium, Potassium, Calcium, Chloride, Bicarbonates, Phosphorus.
- * Anion, cation electroneutrality.

9. Electrophoresis.

- * Immunoelectrophoresis.
- * Gel diffusion.

10. Chromatography.

- * Thin layer.
- * Paper.
- * Gas liquid.

11. Ca and PO₄ estimation.

12. Amylase estimation.

13. Automation.

14. Study of Hormones.

- * Estimation & function effects on body and diseases associated.
 - o ACTH hormone.
 - o Thyroid stimulating hormone.
 - o Testosterone.
 - o Estrogen, Progesterone.
 - o Prolactin.
 - o Growth hormone and oxytocin.
 - o Endocrinology - detailed study.

15. Toxicology.

- * Various drugs and measurement in various samples, their effect, clinical indications and co-relations.
 - o Alcohol.
 - o Amphetamines.
 - o Antiepileptics.
 - o Barbiturates.
 - o Bromides.
 - o Hallucinogens.
 - o Narcotics.
 - o Phenothiazines.
 - o Salicylates.
 - o Metals like Arsenic, Iron, Lead, Lithium, Mercury.

BLOOD BANKING

1. Blood groups and their applications
2. Methods of blood typing
 - * Forward & Back typing
3. Blood donor selection and screening
4. Blood collection and preservation
5. Compatibility testing
 - * Cross matching, transfusion reaction and their investigations
6. Blood bank organisation and methodology

GENERAL MICROBIOLOGY

1. Collection and handling of clinical specimen
2. Methods of sterilization
3. Different staining methods
4. Hanging drop preparation
5. Composition and preparation of simple culture media

MEDICAL MICROBIOLOGY

1. Medical Bacteriology
 - * General outline of culture and sensitivity
 - * Antibiotic sensitivity, its importance and techniques
 - * Bacteriological examination of sputum, pus, throat swab, urine, aspirated fluids, C.S.F., blood culture etc.
 - * Different Biochemical tests for identification of pathogens.
2. Medical Mycology
 - * Fungal infections of skin
 - * Techniques for examining specimen for sub-cutaneous fungi
 - * Intermediate fungi

HISTOPATHOLOGY

1. Selection of tissue for biopsy
2. Fixation of tissue, different types of fixatives
3. Processing of tissue
 - * 9 Stage, clearing of tissue & various agents

4. Tissue embedding and wax impregnation
5. Cutting of tissue
6. staining
 - * Procedure, various stains
7. Microtomy
8. Objective of various Histopathological staining methods
9. Mounting media
10. HNE stain & Pap Smear staining for detection of cancer cells
11. Cytology
12. Clinical procedures for cytologic study of various body sites (Histopathological practicals during Hospital training)

LIST OF PRACTICALS

- (1) Vein Puncture and Finger Pricks
- (2) Preparation of EDTA, Citrate vials

Haematology

- (1) Estimation of hemoglobin by
 - (i) Sahli's method (ii) Drabkin's method
- (2) Estimation of WBC & RBC & Platelets
- (3) Estimation of ESR
- (4) Estimation of PCV
- (5) Differential count
- (6) Determination of G6PD deficiency
- (7) Reticulocyte count
- (8) Sickling test
- (9) Demonstration of LE cell
- (10) Coagulation study
 - (a) Clotting time
 - (i) Lee White method (ii) Capillary method
 - (b) Bleeding time - Duke's method
 - (c) Prothrombin time determination

Biochemistry

- (1) Estimation of Glucose by GOD-POD method
- (2) Estimation of total lipids by phosphovanillin method
- (3) (i) Estimation of Cholesterol by Wybenga-Fileggi method
 - (ii) Estimation of HDL Cholesterol

- (4) Estimation of Triglyceride by enzymatic method
- (5) Estimation of Total proteins and albumin by modified Biuret method
- (6) Estimation of Urea by DM method
- (7) Estimation of Creatinine by Alkaline Pictate method
- (8) Estimation of Uric acid by Phosphotungstate method
- (9) Estimation of Bilirubin by Diazo method
- (10) Estimation of SGPT enzyme by Reitman & Frankel method
- (11) Estimation of SGOT enzyme by Reitman & Frankel method
- (12) Estimation of Alkaline Phosphatase by Kind's ^{method} method
- (13) Estimation of Acid Phosphatase by Kind's method
- (14) Estimation of LDH
- (15) Estimation of CPK by Modified Hughes method
- (16) Estimation of Chloride
- (17) Estimation of Calcium by OCPC method
- (18) Estimation of Inorganic Phosphorous by Gomori's method
- (19) Estimation of Amylase by street ^{method} method
- (20) Estimation of Iron & Total Iron bindings capacity
- (21) Estimation of Na & ^V level by Flame Photometry

Urine Analysis

(1) Physical	(2) Chemical	(3) Microscopic
Color	pH	Pus
Odour	Protein	RBC
Volume	Sugar	Epithelials
Specific Gravity	Occult blood	Casts
	Ketones	Crystals
	Bilirubin	
	Bile salts	

(4) Multiple reagent strips

Examination of Faeces

- (1) Physical (2) Chemical (3) Microscopic

Serology

- (1) VDRL - Slide flocculation test

Preparation of VDRL Antigen

- (2) Widal - agglutination test (i) Tube test
(ii) Slide test

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- (3) Slide test for Rheumatoid factors (Rheumatoid Factor)
- (4) ASO latex test (Antistreptolysin O)
- (5) Pregny test (mons - rapid slide test)
- (6) Visual Elisa Pregnancy test
- (7) C-reactive protein test (slide test)
- (8) HIV detection - COMB AIDS visual test (dot immunassay)

Blood Banking

- (1) Blood grouping test - (i) Tile test (ii) Tube test
Forward grouping i.e. front typing
Backward grouping i.e. back typing
- (2) Determination of "DU" antigen
- (3) Coomb's test - Direct test & Indirect test
- (4) Cross matching
- (5) Rh-Antibody titre determination

Body Fluids

- (1) Semen Analysis
- (2) Sputum Analysis
- (3) Cerebrospinal fluid analysis (CSF)

Bacteriology

- (1) Various Cultural test for different pathological organisms
- (2) Antibiotic Sensitivity test

Other Tests

- (1) Gel Immunodiffusion tests
- (2) Radial Immunodiffusion tests

R.D.M.L.T. 3:

To pass the DMLT examination a candidate must obtain in each paper atleast 40% marks seperately and not less than 50% of the full marks in aggregate in the written & practical examination.

Those successful candidates who obtain atleast 70% of the total marks obtainable will placed in the Distinction & those obtaining 60% to 69.9% will be placed in First Class & those obtaining 50% to 59.9% will be placed in Second Class.