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 – 2020

Curriculum for
Diploma in Medical Laboratory Technology (D.M.L.T.)
June-2019

Ordinance, Regulations and Examination Scheme:

Ordinance:

- **O.DMLT-1:** Candidate for admission to the Diploma in Medical Laboratory Technology (D.M.L.T.) must have passed the **Bachelor of Science (B.Sc.)**degree with principal subject as **Microbiology/ Biochemistry/ Chemistry/ Zoology/ Botany / Biotechnology/ Genetics/ Home Science (Food&Nutrition)/ Medical Lab. Technology/ Clinical Lab. Technology** or bachelor degree of **B.Pharm/ M.B.B.S./ B.A.M.S./ B.H.M.S.** or equivalent examination of any recognized university with 40% or above marks are eligible.
- **O.DMLT-2:** The course of study for the D.M.L.T. will be a full time one academic year (i.e. two terms). No candidate will allowed joining any other course simultaneously.
- **O.DMLT-3:** Candidate who have passed an equivalent examination from any other university or examining body and is seeking admission to the D.M.L.T. course will be required to provide necessary eligibility certificate.
- **O.DMLT-4:** Candidate has to keep minimum 75% attendance in Theory and Practical.No candidate will be admitted to examination for D.M.L.T. unless it is certified by the Principal that he has attended the course of study to the satisfaction of the principal of the college.
- **O.DMLT-5:**Candidate desirous of appearing at examination of the D.M.L.T. course must forward their application in the prescribed form to the controller of examination through the principal of the college on or before the date prescribed for the purpose under the relevant ordinances.
- **O.DMLT-6:** The final exam for the D.M.L.T. shall be held at the end of the academic year.

Regulations & Examination :

- **R.DMLT-1: Standard of Passing the D.M.L.T. degree examination**:
    - Candidate must obtain at least 40% marks separately in External / Internal of each Theory paper / Practical paper
    - Candidate must obtain 45% aggregate marks out of Final Total marks in D.M.L.T. examination. (i.e. 360 out of 800 marks)
    - Class will be awarded based on Earned Grade Point, SGPA and CGPA as per rules of University.

- **R.DMLT-2: Exemption**
    - Candidate failing the D.M.L.T. examination as per above provisions but securing 45 out of 100 marks in any theory paper or practical paper separately may eligible to exempted from appearing again in that paper at the subsequent examination and will be declared to have passed the examination when he passes in all remaining papers in accordance with the above provisions.

- **R.DMLT-3: Marks of Internal and university examination and credit hours**
  - Total marks of each theory paper are 100 (university examination of 70 marks + internal examination of 30 marks).
  - Total marks of each practical paper are 100(university examination of 70 marks + internal examination of 30 marks).
  - Credit hours (lectures) for each paper in the course are 75.

- **R.DMLT-3. Structure of Question Paper**

Question – 1		
Q – 1	Answer the following questions (One word /one line question)	10 (10 x 1 Marks)
Q – 2	Answer the following questions (Any 5 out of 7)	15 (5 x 3 Marks)
Q – 3	Answer the following questions (Any 5 out of 7)	20 (5 x 4 Marks)
Q – 4	Answer the following questions (Any 5 out of 7)	25 (5 x 5 Marks)
	Total	70 Marks

- **R.S.D.M.L.T. - 4. Following is the syllabus of D.M.L.T. Program.**

Course Structure for D.M.L.T.

Course Code	Paper Title	Hour/ Week	Credits	Marks		
				Ext.	Int.	Total
DMLT TH01	Clinical Biochemistry (Theory)	04	04	70	30	100
DMLT PR01	Clinical Biochemistry (Practical)	04	02	70	30	100
DMLT TH02	Haematology, Immunohaematology & Blood Banking (Theory)	04	04	70	30	100
DMLT PR02	Haematology, Immunohaematology & Blood Banking (Practical)	04	02	70	30	100
DMLT TH03	Medical Microbiology & Parasitology (Theory)	04	04	70	30	100
DMLT PR03	Medical Microbiology & Parasitology (Practical)	04	02	70	30	100
DMLT TH04	Clinical Pathology (Theory)	04	04	70	30	100
DMLT PR04	Clinical Pathology (Practical)	04	02	70	30	100
	Total	**32**	**24**	**560**	**240**	**800**

Internal Evaluation for Each Theory Paper – 30 Marks

No.	Pattern	Marks
1	Assignment	10
2	Internal Test	10
3	Seminar / MCQ or One word Test	10

Internal Evaluation for Each Practical Paper – 30 Marks

No.	Pattern	Marks
1	Practical Performance	20
2	Practical Journal	10

Revised DMLT syllabus suggested by panel of Doctors:

1) *Dr. H. L. Kansagra, M.D.(Pathology & Bacteriology)*
   Principal, College of Computer, Science & I.T., Junagadh

2) *Dr. Jaydev M. Pandya, M.D.(Microbiology)*
   Associate Professor, GMERS Medical College, Junagadh

3) *Dr. Killol Desai, M.D.(Pathology)*
   Assistant Professor, GMERS Medical College, Junagadh

4) *Dr. Lipi Patel, M.D.(Biochemistry)*
   Assistant Professor, GMERS Medical College, Junagadh

5) *Dr. Chirag Menapara, M.D.(Pathology)*
   Assistant Professor, GMERS Medical College, Junagadh

Paper – 1 - DMLT TH01 – Clinical Biochemistry

UNIT-I - GENERAL INTRODUCTORY LECTURES *- 14 Marks*

1.1 Introduction and General Aspect of Medical Technology

- *What it entails*
- *Origin*
- *Progress till today*
- *Scope for future*

1.2 Instrumentation:

- *Microscope, Centrifuge, Autoclave, Oven, Water bath, Incubator, Refrigerator, PH Meter*
- *Simple & Analytical Balance*
- *Specialized Instrumentation*
  - *Colorimeter (Beer's and Lambart's law), Spectrophotometer*
  - *Flame Photometer, Nephalometer*
- *Electrophoresis and Chromatography*
- *Automation in Biochemistry:*
  - *Autoanalysers and its various types*
  - *Advantages and Disadvantages of Automation*

1.3 Quality Control:

- *External Quality Control and Internal Quality Control (Preanalytical, Analytical and Post Analytical Errors)*
- *C.V. (Coefficient of variation), S.D. (standard deviation), L.J. charts, Westguard rules*
- *Standards, Controls and Calibrators for Biochemistry*

1.4 Computer Basics:

- *History, Importance, Types of Computers, Structure of Computer, Input-Output Devices, Processing Units, Outline of Data Processing, Computer Memory, External Storage Devices, Hardware, Software*
- *Computer and Communication, Networking, Internet*
- *Use of Computer in Pathology Laboratory*
- *Bar coding and Bar Code Reader*
- *Introduction and use of Pathology Lab. Softwares*

1.5 Hazards in Biochemistry Laboratory

BIO-CHEMISTRY

UNIT-II *- 14 Marks*

2.1 Nitrogenous Compounds.

- *Proteins and amino acids.*
  - *Classification*
  - *Metabolism*
    - *Transamination, Deamination, Urea Cycle (Ornithin cycle)*
    - *PKU (Phenylketonuria), Alkaptonuria*
- *Protein Determination Methods:*
  - *N_2 Analysis, Biuret Reaction(for total proteins)*
  - *BCG (Bromo Cresyl Green) method for Albumin*
  - *Anionic & Cationic Precipitation*
  - *Salting out technique, Phenol Method*
  - *Dye binding method, Precipitation methods, Electrophoretic methods*

- *Plasma Proteins*
  - *Types, Functions, Properties, Electrophoretic patterns, AG Ratio*
  - *Immunoglobulins,*
  - *Clinico-pathological correlations and diseases associated*

2.2 Non protein nitrogenous compounds.

- *Urea, Creatinine, Uric Acid, Ammonia*

Biochemistry, Methods of estimation and Clinico-pathological correlations of each compound

2.3 Carbohydrates

- *Classification, Glucose metabolism*
  (Digestion, Absorption, Hepatic and Cellular metabolism, TCA cycle, HMP shunt)
- *Methods of Glucose Estimation:*
  - *Folin - Wu method, Nelson - Somogye's method, O - Toluidine method,*
  - *GOD - POD Method, Hexokinase method*
- *Diabetic Mellitus*
  - *Symptoms, Signs, Types*
- *Methods of Disease Diagnosis*
  - *F.B.S. (Fasting Blood Sugar)*
  - *P.P.B.S. (Post prandial Blood Sugar)*
  - *Random Blood Sugar*
  - *Urine and Blood ketones(Benedict's Tests and Rothara's Tests)*
  - *Glucose Tolerance Test*
    (Indication, Contra-indication, Procedure, Interpretation of GTT result)
  - *HbA1C (Glycosylated Hb)*
  - *Serum Insulin Level*
  - *C-Peptide*

UNIT-III ***- 14 Marks***

3.1 Enzymes

- *Nomenclature, Types, Classification, Properties*
- *Factors affecting Enzyme activity*
- *Enzymatic Kinetic Methods and Role of $\triangle$-A^o (Delta Absorbance)*
- *Isoenzymes and Coenzymes*
- *Therapeutic, Diagnostic and Analytical uses of Enzymes*
- *Significance of Enzymes (Phosphatases, Transaminases, LDH, CK(Total and MB), Amylase, Lipase, Gamma Glutamyl transferase, Acetyl Choline Esterase)*

3.2 Hormones

- *Estimation & function effects on body and diseases associated*
  - *ACTH hormone*
  - *FSH, LH, Prolactin, Oxytocin, Growth Hormone, etc.*
  - *TSH (Thyroid Stimulating hormone)*
  - *Thyroid Hormones: T_3, T_4, FT_3, FT_3,*
  - *Testosterone, Estrogen, Progesterone*

3.3 Vitamins

- *Introduction*
- *Determination of Vitamin B_{12}*
- *Determination of Vitamin D_3*

3.4 Electrolytes & Blood gases

- *Sodium, Potassium, Calcium, Chloride, Bicarbonates, Phosphorus*
  - *Anion Gap, Anion Cation electro neutrality, Blood pH (Acidosis and Alkalosis)*

UNIT-IV ***- 14 Marks***

4.1 Lipids.

- *Biochemistry and Classification.*
- *Lipid Profile Tests*
  - *Instructions to Patient*
  - *Tests: Total Lipids, Total Cholesterol, S.Triglyceride, HDL-Cholesterol LDL-Cholesterol, VLDL-Cholesterol, Cholesterol/HDL, HDL/HDL Non-HDL Cholesterol,*
    Extended Lipid Profile Test (Apo, Lipoprotein(a), Apolipo-A1, Apolipo-B)
    Clinico-pathological correlation
    Abnormal Lipoprotein (Hypercholesterolemia, Hypertriglyceridemia)

4.2 Heart Function Test

- *SGPT, SGOT, LDH and Isoenzymes, CPK and their estimation*
- *Troponin-I and Troponin-T Test*
- *Myoglobin Tests*
- *Hs-CRP Test*
- *Homo-cystine Test*

4.3 Pancreatic Function Test

- *Estimation of Amylase and Lipase*

UNIT-V ***- 14 Marks***

5.1 Liver function tests

- *Anatomy and Physiology of Liver*
- *Bilirubin metabolism, Classification of jaundice, estimation of direct & indirect bilirubin.*
- *Enzymatic Test to detect liver Disease (SGPT, SGOT, Alkaline Phosphatase, Gamma GT)*
- *Protein Estimation and AG Ratio*
- *Metabolic tests.*
- *Glucose tolerance, fructose tolerance, epinephrine tolerance,*
  - *Cholesterol estimation, estimation of bile acids*
- *Floculation Test*
- *Thymol Turbidity Test*
- *Foreign substance excretion (Rose Bengal excretion, Sulobrompthdein excretion)*
- *Blood ammonia determination.*

5.2 Kidney function test

- *Anatomy and Physiology of Kidney*
- *Glomerular Function (Renal Clearance Test to detect GFR)*
- *Urea and creatinine clearance methods*
- *Principles of renal clearance*
- *Tubular function (Concentration Test, Osmolality and Specific Gravity Test)*
- *PSP excretion test*

5.3 Tumor Markers

- *Various types of Tumor Markers*
  (Enzymes, Hormones, Carbohydrates, Fetal Proteins, Oncogenes)
- *Role of Tumor Markers in Diagnosis and Prognosis of Cancer*

Practical based on Theory Paper – 1

DMLT PR01 – Clinical Biochemistry

1. *Preparation of standard solution, Molar solution & other reagents*

2. *Hazards in biochemistry laboratory*

3. *Instrumentation*
    a. *Operation of Balances (Single pan & Digital weighing scale)*
    b. *Colorimeter*
    c. *Spectrophotometer*
    d. *Semi Autoanalysers*
    e. *Electrophoresis (demonstration)*

4. *Clinical Biochemistry Test (All tests should be done on auto analyser)*
    a. *Blood Glucose / Sugar estimation & GTT (GOD-POD) method*
    b. *Blood / Urine Urea (Bertholet's method)*
    c. *Blood / Urine Creatinine (Jaffe's alkaline picrate method)*
    d. *Serum Total Protein (Biuret method)*
    e. *Serum Albumin (BCG - Bromo Cresyl Green method)*
    f. *Blood Total Cholesterol*
    g. *S.Triglyceride*
    h. *HDL & LDL Cholesterol*
    i. *S.Bilirubin test, Total, Direct (Conjugated), Indirect (Unconjugated) – (Diazo method)*
    j. *Estimation of Calcium by (Arsenazo or OCPC) method*
    k. *Estimation of Phosphorus*
    l. *Estimation of NA+, K+, CL- by Chemical method*
    m. *Estimation of Enzyme*
        i. *SGPT(Serum Glutamic Pyruvic Transaminase)/ ALT (Alanine Transaminase)*
        ii. *SGOT(Serum Glutamic Oxaloacetic Transaminase / AST (Aspartate Transaminase)*
    n. *Estimation of Alkaline Phosphatase (ALP)*

5. *Estimation of Iron / TIBC (Total Iron Binding capacity)*

6. *Autoanalyser, Electrolyte Analyser, Arterial Blood gas Analyser, Chemiluminance equipment, Spectrophotometer (Demonstration practical only)*

Paper – 2 - DMLT TH02 – Haematology, Immunohaematology & Blood Banking

HAEMATOLOGY

UNIT-I ***- 14 Marks***

1.1 Methods of Blood collection
- *Capillary and venous blood*
- *Anatomy of veins from the elbow region*
- *Complications of vein puncture (immediate and delayed)*
- *Arterial Blood collection for Blood Gas Analysis*

1.2 Anticoagulants - their uses & reasons for choice

1.3 Preparation of Slides for Blood examination (thin, thick and wet blood films)

1.4 Physiology of blood formation (Hematopoiesis)
- *Erythrocyte production (Erythropoiesis)*
- *Leucocyte (Leucopoiesis and Lymphopoiesis)*
- *Thrombocyte (Thrombopoiesis)*
- *Hemoglobin (Structure and Formation in body)*

1.5 Theory & Estimation of,
- *RBC Count,*
- *WBC Count,*
- *Differential Count,*
- *Packed Cell Volume*
- *Erythrocyte Sedimentation rate,*
- *Hemoglobin,*
- *Red Cell indices*
- *Absolute Eosinophil Count,*
- *Reticulocyte count and index*
- *Complete cell count (CBC) and histograms by cell counter method*

1.6 Significance of each WBC (Leukopenia and Leukocytosis)

1.7 Peripheral blood smear examination in various diseases

1.8 Bone marrow aspiration &biopsy

1.9 Blood Parasites
- *Recognition of malaria and microfilaria parasites*

1.10 Automation
- *Coulter Counter*
- *Particle Counter*

1.11 Haemotological diseases
- *Lupus Erythematosus*
- *Infectious mononucleosis*
- *Paroxysmal nocturnal Hemoglobinuria*
- *Diagnostic Tests for above diseases*

UNIT-II ***- 14 Marks***

2.1 Anemia

- *Acute*
- *Chronic*
- *Iron deficiency anemia*
- *Vitamin B_{12}& Folate deficiency anemia*
- *Aplastic Anemia*
- *Hemolytic Anemia (Thalassemia, Sickle Cell Anemia, G6PD deficiency, etc.*
- *Refractory Anemia*
- *Sideroblastic Anemia*

2.2 Hemoglobinopathies and Hemoglobin Electrophoresis

- *Normal & Abnormal hemoglobin with nomenclatures*
- *Abnormal Hemoglobin Syndromes*
  - *Thalassemia: B-Thalassemia (Major & Minor)*
- *Sickle Cell disease*
  - *Sickle cell trait*

2.3 Hemoglobin

- *Hemoglobin C diseases and trait*
- *Hemoglobin D diseased and trait*
- *Doubly heterozygous states : SC, SD disease*

2.4 Laboratory studies in hemoglobinopathies

- *Osmotic Fragility (NESTROFT test)*
- *Sickling Test*
- *Dithionite tube test*
- *Alkali Denaturation test for HbF(Fetal Hemoglobin)*
- *Electrophoresis of Hb*

UNIT-III ***- 14 Marks***

3.1 Glucose 6 Phosphate dehydrogenase deficiency disease (G6PD)

- *Causes and diagnostic tests*

3.2 Polycythemia (Relative Polycythemia &Polycythemia vera)

3.3 Leukemia

- *Acute & Chronic (Lymphocytic, Monocytic & Myelocytic.)*
- *Cytochemistry Method to identify type of leukemias.*
- *Hodgkin's lymphomas & non Hodgkin's disease.*
- *Multiple myeloma.*
- *Waldenstrom's macrogiobulinemia.*
- *Leukemoid reactions.*

3.4 COAGULATION

- *Intrinsic and extrinsic pathways of coagulation system*
- *Role of blood platelets*
- *13 coagulation factors*
  - *Description, properties, significance & disease associated*
- *Vascular hemophilia*
- *Disseminated intravascular coagulation*

- *Coagulometers*
  - *Semiautomated*
  - *Fully automated*
- *Procedures to find deficiency of factors*
  - *Prothrombin time*
  - *Bleeding time - Duke and Ivy method*
  - *Whole blood clotting time*
  - *Clot retraction*
  - *D-dimer test*
  - *Fibrinogen determination*
  - *Platelet count*
  - *Partial thromboplastic time*
  - *Tourniquet test*

3.5 Immunohaematology

- *Hetero Immune diseases*
- *Iso Immune diseases*
- *Hemolytic disease of the new born (HDN)*
- *Auto Immune diseases*
- *Complete and Incomplete antibodies*

<u>UNIT-IV</u> - BLOOD BANKING Part-1 ***- 14 Marks***

4.1 Blood groups (ABO & Rh) and their applications
4.2 Other rare Blood group systems like MNS, KELL, DUFFY, KID, etc.
4.3 Methods of blood typing
  a. Forward & Backward(Reverse) typing
4.4 Blood donor selection and rejection criteria as per WHO guidelines(recent)
4.5 Blood collection and preservation

<u>UNIT-V</u> - BLOOD BANKING Part-2 ***- 14 Marks***

5.1 Compatibility testing
  a. Cross matching (major, minor and emergency cross match)
5.2 Blood Transfusion reactions (immediate and delayed)
5.3 Investigation of Blood Transfusion reaction
5.4 Component of Bloods and their uses and method of preparation
5.5 Blood bank organisation and methodology
5.6 Laboratory Tests for various Transfusion Transmitted disease (TTD) including Rapid tests & ELISA

Practical based on Theory Paper – 2

DMLT PR02 - Haematology, Immunohaematology & Blood Banking

HAEMATOLOGY

1. *Methods of Blood collection*
    a. *Capillary / Fingertip collection*
    b. *Venous Blood collection (Phlebotomy)*
    c. *Vacuate Blood collection*
    d. *Arterial Blood collection*
        i. *Redial Artery*
        ii. *Brachial Artery*
2. *Anticoagulants bulb, their contents and colour code of vacuate*
3. *Haemoglobin estimation by Sahli's method*
4. *Haemoglobin estimation by Cyanmethaemoglobin method*
5. *Counting chamber (Neubauer's Chamber, HB pipette (Sahli's Pippette), RBC pipette, WBC pipette*
6. *Total WBC count*
7. *RBC count*
8. *Platelet count*
9. *Reticulocyte count (by NEW methylene blue / Brilliant cresyl blue)*
10. *Absolute Eosinophil count (Direct / indirect)*
11. *Preparation of IDEAL Smear*
12. *Differential count (Staining by Field, Lishman, Jimsa, etc.)*
13. *PS examination (Peripheral Smear examination)*
14. *Test for G6PD deficiency*
15. *Test for sickling*
16. *HB Electrophoresis (Demonstration test)*

BLOOD BANKING

1. *Introduction of Blood Banking*
2. *ABO cell grouping & Serum grouping (slide and tube method)*
3. *Rh grouping (various techniques)*
4. *Du variant (Rh) test*
5. *Coomb's test, Direct Coomb's test, Indirect Coomb's test*
6. *Cross matching (compatibility testing) – Saline, Albumin and Direct cross matching in emergency*

Paper – 3 - DMLT TH03 – Medical Microbiology & Parasitology

UNIT-I ***- 14 Marks***

GENERAL MICROBIOLOGY

1.1 Pioneers in Microbiology
- *a. Antony Van - Leeuwenhook*
- *b. Louis Pasteur*
- *c. Joseph Lister*
- *d. Robert Koch (Koch's postulates)*

1.2 Collection and handling of clinical specimen
1.3 Methods of sterilization and disinfection
1.4 Composition and preparation of simple Culture Media
1.5 Different Staining methods to know size, shape and morphology of Bacteria

APPLIED MICROBIOLOGY

1.6 Automation in Diagnostic Microbiology: Bactec, Bactealert, Versatec automated systems
1.7 Quality control in Diagnostic Microbiology
1.8 Disposal of biomedical waste
1.9 Hospital acquired infection (Nosocomial infection)
1.10 Laboratory Hazards

UNIT-II ***- 14 Marks***

MEDICAL BACTERIOLOGY

2.1 General outline of culture and sensitivity
2.2 Antibiotic sensitivity, its importance and techniques
2.3 Bacteriological examination of Sputum, Pus, Throat swabs, Urine, Stool, Aspirated fluids (Plural fluid, Peritoneal fluid, CSF, etc.)
2.4 Blood culture examination
2.5 Different Biochemical tests for identification of pathogens
2.6 Short study of Bacteria (Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteria, Coliforms, Proteus, Salmonella, Shigella, Vibrio, spriochaetes, Hemophillus and Mycobacteria)

UNIT-III ***- 14 Marks***

MEDICAL VIROLOGY

3.1 General properties of Virus
3.2 Morphology replication and cultivation of Viruses
3.3 Polymerase Chain Reaction (PCR) for Viral diagnosis
3.4 Causes of following Viral Diseases, their Laboratory Diagnosis and prevention measures for
- *a. HIV_{1-2} Virus*
- *b. Dengue Viruses*
- *c. Hepatitis Viruses*
- *d. NS_1 Viruses (Swine Flu Viruses)*
- *e. Chickengunea*

MEDICAL MYCOLOGY

3.5 Morphological classification of Fungi
3.6 Laboratory diagnosis of Fungal infections
3.7 KOH wet preparation of skin and subcutaneous fungi
3.8 Fungal culture media

UNIT-IV ***- 14 Marks***

MEDICAL PARASITOLOGY

4.1 General Introduction, Host-Parasite Relationship

4.2 Protozoology: Introduction, classification and importance
- *Protozoology: E.Hystolytica, E.Coli,Intestinal, oral and genital flagellates (G.Lamblia, T.Vaginalis, etc.), B.Coli*
- *Blood Protozoa: Malaria and their species*

4.3 Helminthology: Introduction, classification and importance
- *Cestodes: Tapeworms - T.Saginata, T.Solium, D.Latum, E.Granulosus, H.Nana*
- *Trematodes: Flukes – Fasciola hepatica (Liver), Paragonimus westermani (Lung), Schistosoma (Intestinal)*
- *Nemetods:*
- *Intestinal:*
  - *Small intestine: A.Lumbricoides (Round worm), N.Americanus Ancylostoma duodenale (hook worm), Strongyloides, Stercoralis*
  - *Cecum and appendix: 1) E.Vermicularis(pin worm), 2) T.Trichiura(whip worm)*
- *Lymphatic system: W.bancrofti, B.Malayi,(Filariasis)*
- *Lung: Strongyloides stercoralis*
- *Subcutaneous tissue: Loa-Loa, O.Volvulus (Filariasis)*
- *Skin: D.Medinensis(Guinea worm)*

4.4 History, geographic distribution, Habitat, morphology and life cycle (pathological effects and laboratory diagnosis of above Helminths)

UNIT-V ***- 14 Marks***

MEDICAL IMMUNOLOGY (SEROLOGY)

5.1 Infection,Immunity, Antigen,Antibody, Heptanes, etc.

5.2 Antigen-Antibody reaction (General features

5.3 Precipitating Test, Agglutination Test, Flocculation Test

5.4 ELISA (Enzymes Linked Immuno Sorbent Assay), RIA (Radio Immuno Assay), FIA (Florescent Immuno Assay, CLIA (Chemi Luminescent Immuno Assay)

5.5 Complement and Complement Fixation Test

5.6 Serodiagnostic Tests for,
- *Syphilis (VDRL)*
- *Widal Test (Typhoid)*
- *Hepatitis associated antigen(HbsAg)*
- *C-Reactive protein (CRP)*
- *Rheumatoid factor*
- *Antinuclear Antibody (ANA)*
- *Antistreptolysin O titre (ASO)*
- *IgG, IgM, IgA, IgE, IgD antibodies*

5.7 Hypersensitivity Tests
- *Tuberculin Test (Montoux test for Tuberculosis)*
- *Casoni's Test for hydatid diseases*

Practical based on Theory Paper – 3
DMLT PR03 – Medical Microbiology & Parasitology

1. *Use and care of Microscope*
2. *Cleaning, Neutralization & preparation of Glassware for Sterilization*
3. *Examination of Living Bacteria*
    a. *Wet Mount preparation*
    b. *Hanging Drop preparation*
    c. *Semi Solid Slant Agar test*
4. *Staining of Bacterial cells*
    a. *Simple staining*
    b. *Negative Staining*
5. *Differential Staining*
    a. *The Gram's staining*
    b. *The AFB (Acid Fast Bacilli) Staining – Z-N Staining method*
6. *Special Staining (demonstration only)*
    a. *The Spirochaetes Staining (Silver Nitrate impregnation method)*
    b. *The Metachromatic Granules Staining (Albert's stain)*
    c. *The Spore Staining*
    d. *The Capsule Staining*
    e. *Flagella Staining*
7. *Preparation of Media, pH adjustment and preparation of Buffers*
8. *Bacteriological Media: Nutrient Agar, Blood Agar, Chocolate Agar, MacConkey's Agar, Wilson & Blair's Agar for Salmonella, CLED's medium for UTI, King's Medium for pseudomonas, Mannitol Agar for Staphylococci*
9. *Mycological Media*
    a. *Potato Dextrose Agar*
    b. *Sabouraud's Agar*
10. *Pure Culture study of following culture (demonstration only)*
    a. *Staph.Aureus*
    b. *E.Coli*
    c. *Pneumococci*
    d. *Proteus Vulgaris*
    e. *Pseudomonas*
11. *Isolation and Identification of aerobic bacteria*
12. *Antibiotic sensitivity testing*

Serology

1. *Diagnostic Tests*
    a. *ICT(Immuno Chromatography Test) / DOT Immunoassay / Flow through Assay for HIV_{1-2}*
    b. *ICT(Immuno Chromatography Test) / DOT Immunoassay / Flow through Assay for HBsAg*
    c. *ICT(Immuno Chromatography Test) / DOT Immunoassay / Flow through Assay for HCVAb*
    d. *Slide / Tube / Strip(Typhi-dot) test for typhoid*
    e. *VDRL / RPR / Card test for Syphilis*
    f. *Latex test for R.A.(Rheumatoid Arthritis)*
    g. *Latex test for CRP (C-reactive Protein)*
    h. *Latex test for ASO (Anti Streptolysin-O)*
2. *Demonstration tests*
    a. *Dengue (NS_1 –Antigen, IgG, IgM antibodies)*
    b. *Chikungunya*
    c. *Immuno Assay for Tuberculosis*
    d. *Tuberculin test (Monteux test)*
3. *Demonstration of Fungi – Penicillin / Aspergillus / Mucar / Yeast*
4. *Immunological Tests for Malaria (Antigen and Antibody test for P.Vivax & P.Falciparum)*

Paper – 4 - DMLT TH04 – Clinical Pathology

UNIT-I ***- 14 Marks***

URINE ANALYSIS

1.1 Anatomy of Urinary Track System
1.2 Composition of Urine
1.3 Collection, Preservation and Transportation of Urine Sample
1.4 Examination of Urine - Physical, Chemical and microscopic examination of urine
1.5 Urinary Findings in Common Renal Diseases and Urinary Calculi.

EXAMINATION OF BODY FLUIDS

UNIT-II ***- 14 Marks***

2.1 Cerebrospinal Fluid (CSF)
- *Anatomy and Physiology of meninges*
- *Procedure of Lumber puncture and collection of CSF (Indications, contra indications & problems with Lumber puncture)*
- *Physical, Chemical and microscopic examination of CSF*
- *Correlation of abnormal CSF findings in various CNS Diseases*
  - *Pyogenic meningitis*
  - *Tuberculous meningitis*
  - *Aseptic (Viral) meningitis*
  - *Brain Tumor, etc.*

2.2 Aspirated fluid (Body Fluids)
- *Difference between Transudates & exudates*
- *Collection and Examination: Physical, Chemical and Microscopic, etc. of following body fluids*
  - *Pleural Fluid*
  - *Peritoneal (Asitic) Fluid*
  - *Pericardial Fluid*
  - *Synovial Fluid*

UNIT-III ***- 14 Marks***

3.1 Gastric Fluid
- *Anatomy and Physiology of Stomach*
- *Collection, preservation and analysis of Gastric Juice*
- *Diagnostic importance of Gastric juice examination in various clinical conditions*

3.2 ***SEMEN ANALYSIS***
- *Anatomy and Physiology of male reproductive system*
- *Collection of SEMEN*
- *Gross (Physical), Chemical and Microscopic Examination as per WHO recommendation*
- *Medicolegal significance of SEMEN examination*
- *Automation in SEMEN examination*

UNIT-IV ***- 14 Marks***

4.1 STOOL ANALYSIS

- *Collection, preservation and transportation of STOOL*
- *Routine examination of STOOL (physical, chemical & microscopic examination)*
- *Concentration method for OVA and CYSTS*
- *Saline preparation, iodine preparation and handing drop preparation in STOOL examination*

4.2 SPUTUM ANALYSIS

- *Anatomy and physiology of respiratory system*
- *Collection, preservation and transportation of SPUTUM*
- *Macroscopic and Microscopic examination of SPUTUM*
- *Petroff's method for concentration of SPUTUM for AFB examination*
- *SPUTUM findings in various Diseases*

UNIT-V ***- 14 Marks***

5.1 HISTOPATHOLOGY

- *Selection of tissue for biopsy*
- *Fixation of tissue, different types of fixatives*
- *Processing of tissue (Manual method and Auto Tissue processors)*
- *Tissue embedding and wax impregnation*
- *Microtomy - Cutting of tissue, Microtomes and knives*
- *Recognition and correction of faults in sectional cutting*
- *Staining Procedure, various stains (H&E staining, Paps Staining)*
- *Mounting media*
- *Decalcification procedures*
- *Frozen section procedures and its applications*
- *Museum mounting of specimen*
- *Preservation of slides and Blocks of Tissue*

Practical based on Theory Paper – 4
DMLT PR03 – Clinical Pathology

1. *Urine Analysis - Physical, Chemical & Microscopic examination (3 session)*
2. *Stool Analysis - Physical, Chemical & Microscopic examination (2 session)*
3. *Sputum Examination - Physical and Microscopic examination (1 session)*
4. *Semen Examination - Physical, Chemical & Microscopic examination (1 session)*
5. *Body Fluids (each separately) - Physical, Chemical & Microscopic examination*
6. *CSF - Physical, Chemical & Microscopic examination (1 session)*
7. *Cutting, Fixation & Processing of Tissue (demonstration)*
8. *Staining of Tissue*
    a. *Haematoxylin & Eosin for Paraffin section*
    b. *Pap's staining for cytology*
9. *Mounting Media*
10. *Museum Technology*
    a. *Fixation*
    b. *Cutting of Specimen for mounting*
    c. *Preparation of Glass frames and Jars*
    d. *Mounting Fluids*

Suggested Reference Books:

- *ESSENTIALS CLINICAL PATHOLOGY*
  – Author: SHIRISH KAWTHALKAR, Jaypee Brothers Medical Publishers
- *MEDICAL LABORATORY TECHNOLOGY PART I & II*
  – Author: Praful Godkar, Bhalani Publication
- *MEDICAL LEBORATORY TECHNOLOGY*
  – Author: Ramnik Sood, Jaypee Brothers Medical Publishers
- *CLINICAL DIAGNOSIS AND MANAGEMENT BY LABORATORY METHODS*
  – Author: John Bernard Henry, All India Traveller Bookseller
- *MEDICAL LAB. TECHNOLOGY – I, II & III*
  – Author: K.L.MUKHERJEE, TMH Publication
- *ATLAS AND TEXT OF HEMATOLOGY*
  – Author: TEJINDAR SINGH, AVICHAL PUBLISHING COMPANY
- *MEDICAL PARASITOLOGY*
  – Author: D.R.ARORA, CBS PUBLISHERS & DISTRIBUTOR
- *MEDICAL LABORATORY SCIENCE – Author: J. OCHEI, MACGRAW HILL*
- *THE SHORT TEXTBOOK OF MEDICAL LABORATORY FOR TECHNICIANS*
  – Author: SATISH GUPTE, JAYPEE BROTHERS MEDICAL PUBLISHERS
- *TEXTBOOK OF MEDICAL PARASITOLOGY*
  – Author: C.K.J. PANIKERS, Jaypee Brothers Medical Publishers
- *ESSENTIALS OF BLOOD BANKING*
  – Author: S.R. MEHDI, Jaypee Brothers Medical Publishers
- *BIOCHEMISTRY LABORATORY MANUAL*
  – Author: ARTI PANDEY, Jaypee Brothers Medical Publishers
- *RAPID REVIEW OF HEMATOLOGY*
  – Author: RAMADAS NAYAK, Jaypee Brothers Medical Publishers
- *LABORATORY PRACTICAL – I & II*
  – Author: MONICA CHESSBROUP, CAMBRIDGE UNIVERSITY PRESS
- *MEDICAL PARASITOLOGY – Author: P.CHAKRABORTY, NEW CENTRAL BOOK AGENCY*
- *HAEMATOLOGY – Author: Ramnik Sood, Jaypee Brothers Medical Publishers*
- *PARASITOLOGY – Author: K. D. Chatterjee*
- *INSANT NOTES MEDICAL MICROBIOLOGY*
  – Author: WILLIAM IRVING, VIVA PUBLICATION
- *MICROBIOLOGY THEORY FOR MLT*
  – Author: NAMITA JAGGI, Jaypee Brothers Medical Publishers
- *DIAGNOSTIC MICROBIOLOGY*
  – Author: RAJAN KUMAR DE, Jaypee Brothers Medical Publishers
- *ESSENTIALS OF MICROBIOLOGY – Author: ANURADHA DE, NATIONAL BOOK DEPOT*
- *CLINICAL PATHOLOGY AND HAEMATOLOGY*
  – Author: NANDA MAHESHWARI, Jaypee Brothers Medical Publishers
- *CONCISE BOOK OF MEDICAL LABORATORY TECHNOLOGY*
  - Author: RAMADAS NAYAK, Jaypee Brothers Medical Publishers
- *MANUAL OF MEDICAL LABORATORY TECHNIQUES*
  – Author: S. Ramakrishnan, , Jaypee Brothers Medical Publishers
- *RAPID REVIEW OF HEMATOLOGY*
  – Author: RAMADAS NAYAK, Jaypee Brothers Medical Publishers
- *PRACTICAL MANUAL OF HEMATOLOGY*
  – Author: GIRISH KAMAT, Jaypee Brothers Medical Publishers
- *PRACTICAL PATHOLOGY – Author: HARSH MOHAN, Jaypee Brothers Medical Publishers*
- *MCQS IN MEDICAL LABORATORY TECHNOLOGY*
  – Author: Ramnik Sood, Jaypee Brothers Medical Publishers
- *BIOCHEMISTRY LABORATORY MANUAL*
  – Author: ARTI PANDEY, Jaypee Brothers Medical Publishers
- *CONCISE POCKET MEDICAL DICTIONARY, Author: U. N. Panda, Jaypee Brothers*