

GUJARAT UNIVERSITY OF TRANSPLANTATION SCIENCES

Postgraduate Diploma In Medical Laboratory Technology

Introduction

The government of Gujarat has granted the status of State University to G.R. Doshi and K.M. Mehta Institute of Kidney Diseases and Research Centre (IKDRC) and Dr. H.L. Trivedi Institute of Transplantation Sciences (ITS) in recognition of yeoman services provided by this twin institutes. The University established under Gujarat Act No.9 of 2015, is named as “Gujarat University of Transplantation Sciences” (GUTS).

IKDRC was created in 1977 with private-public partnership. It grew to be the largest tertiary care centre of its kind in the world with 200 indoor beds for Nephrology, Urology and Transplantation services in 1992. The Institute of Transplantation Sciences with 200 additional beds was added in 1997 and was named after its founder Dr. H.L. Trivedi in 2006. These happen to be the largest tertiary care centres of the country with about 400 indoor beds, and having full time faculty serving patients from all classes from all over the globe. Their outpatient services cater to more than 1,50,000 patients annually. They are one of the best in research, service and education, all three arms equally strong and well developed as envisioned by their founder. They perform about 350-400 kidney transplants and 40 liver transplants every year, the highest in the country and the only one to function in public sector. Active postgraduate teaching programs in Nephrology, Urology, Anesthesia and Pathology are ongoing for last 25 years.

With the creation of GUTS, IKDRC-ITS have become constituent teaching institutes of GUTS. The institute has an active department of Pathology, Lab Medicine, Transfusion Services and Immunohematology with highly qualified faculty and experienced staff. As per the revised guidelines by Drugs Controller General of India, and existing requirements of Blood Banks in the Drugs & Cosmetics Act, 1940 and Rules thereunder to meet the latest standards, all blood banks in the country are required to be staffed by adequately trained personnel including qualified technicians with Diploma In Medical Lab Technology (DMLT). At present there are

limited facilities and centres providing such courses in Gujarat. Hence we are starting the course of DMLT under GUTS. IKDRC-ITS will be training candidates and degrees will be awarded by GUTS. These technicians will be providing services to different labs in the state as well as in the country.

REGULATIONS FOR DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY

1. ELIGIBILITY FOR ADMISSION

- i) Candidates who have completed BSc in Biochemistry, Microbiology, Chemistry will be eligible to apply for this course.
- ii) Candidates shall be medically fit.

2. ENTRANCE/ SELECTION TEST

Selection of the candidates will be based on the merit at the time of application or on the basis of the entrance examination held by University or Competent Authority, whichever is applicable.

3. AGE LIMIT FOR ADMISSION:

A candidate should have completed the age of 20 years at the time of admission or would complete the said age on or before 31st December of the year of admission to the Diploma In Medical Laboratory Technology.

4. COMMENCEMENT OF THE COURSE:

The course shall commence from 1st August of the academic year.

5. MEDIUM OF INSTRUCTION:

Medium of Instruction will be English for all the Subjects of study and for examinations.

6. CURRICULUM:

The Curriculum and the syllabus for the course shall be as prescribed in these regulations and are subject to modifications by the Academic Council of the University from time to time.

7. DURATION OF THE COURSE:

The duration of certified study shall be for a period of one academic year.

8. RE-ADMISSION AFTER BREAK OF STUDY: will not be permissible.

There will be no readmission after break in study period.

9. WORKING DAYS IN THE ACADEMIC YEAR:

Each academic year shall consist of not less than 240 working days.

10 ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATION:

No candidate shall be permitted to appear in any one of the parts of Examinations unless he/she has attended the course in the subject for the prescribed period and has produced the necessary certificate of study, attendance and satisfactory conduct from the Head of the Department and from the Head of the Institute.

- A candidate is required to put in a minimum of 85% of attendance in both theory and practical separately in each subject before admission to the examinations.

11. CONDONATION OF LACK OF ATTENDANCE:

There shall be no condoning for lack of attendance.

12. VACATIONS:

Public holidays will be given however no vacations will be granted.

13. INTERNAL EXAMINATION:

The Internal Assessment will be held about 2 months before the final exit examination and shall consist of the following points for evaluation:-

- i)Theory
- ii)Practical

14. FINAL EXIT EXAMINATION

The final exit examination will be held at the end of the academic year.

15. EXAMINATION CALENDER: In the month of July of the academic year concerned

ACADEMIC CALENDER

Advertisement regarding admission	:	2 nd week of June
Application forms available on line from	:	2 nd week of June
Last date for receiving the applications	:	within ten days of advertisement for admission
Interview / Counselling	:	July 1 st week
Commencement of Courses	:	1 st August
Last date of admission	:	8 th August

EXAMINATIONS

Annual exit examinations: last week of July

Supplementary examinations: last week of October

New batch effective from 1st August

16. DURATION:

Course Duration	1 year
Hours per week	40
Hours in academic year	1720
No. of working days in year	240

17. MARKS QUALIFYING FOR PASSING:

Theory Examinations : At least 45% of marks in each paper

Practical Examinations : At least 45% of marks in each paper

Award of Class:

1. Pass class: 45% to < 50%
2. Second class: 50% to < 60%
3. First class: 60% to <70%
4. **Distinction: $\geq 70\%$**

18. CARRY OVER OF FAILED SUBJECTS AND EXEMPTION:

(1) A candidate will have to pass in theory and practical examinations separately in each subject paper

(2) If a candidate fails in either theory or practical examination, he/she has to reappear for both (theory and practical) of the same subject paper ONLY.

(3) The candidate will be declared successful only after he/ she pass all the subject papers (both theory and practical).

(3) The candidate has to successfully complete the course in maximum 3 trials within 2 years from the date of joining.

19. PRACTICAL EXAMINATION

Maximum number of candidates for practical examination should not exceed 25 per day. An examiner should be a lecturer or above in any of the institutions of Allied Health Sciences recognized by GUTS.

20. NUMBER OF EXAMINERS FOR EXIT EXAM : One internal and one external examiner will jointly conduct practical examination for each student. The internal examiner will be the Chairman of Examination.

PAPERS

Course Code	Subject	Duration of Examination (Practical & Theory each)	Distribution of marks				Total
			Theory University exam	Theory Internal Exam	Practical University exam	Practical Internal exam	
DMLT-1	Clinical Biochemistry	3 hours	80	20	80	20	200
DMLT-2	Medical Microbiology	3 hours	80	20	80	20	200
DMLT-3	Clinical Pathology and Histopathology	3 hours	80	20	80	20	200
DMLT-4	Hematology & Blood banking	3 hours	80	20	80	20	200
TOTAL			320	80	320	80	800

SYLLABUS FOR DIPLOMA IN MEDICAL LABORATORY

DMLT-1: CLINICAL BIOCHEMISTRY

Course Hours (Theory): 60 hours

MUST KNOW:

UNIT: 1 Introduction & General aspects

- Introduction to Clinical Biochemistry
- Study of weights, volumes and Units, Inter-conversion of units, Measurements
- Preparation of solution
- Normal biological references value
- Different anticoagulants used in Clinical Biochemistry, its application and Mechanism of action.
- Hazards in the Laboratory, Needle prick injury, Spillage blood
- Universal Precaution

UNIT: 2 Instrumentation

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

UNIT: 3 General Biochemistry of Carbohydrates

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

UNIT: 4 General Biochemistry of Proteins

- Amino acids Chemistry - Classification & Properties
- Protein Chemistry- Classification & Properties

- Properties of Plasma proteins
- Immunoglobulins
- Protein metabolism : Transamination, Deamination, Urea cycle, Phenyl ketonuria, Alkaptonuria

UNIT: 5 General Biochemistry of Lipids

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

UNIT: 6 Nucleic acids

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

UNIT: 7 Enzymes

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

UNIT: 8 Minerals & Vitamins

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

UNIT: 9 Function Tests

- 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.

UNIT: 10 Acid-Base Balance

- pH
- Blood buffers
- Acid-base balance
- Metabolic Disorder
- Anionic gap

UNIT: 11 Clinical Laboratory: Quality Control (Internal and External), NABL, Recent techniques in biochemistry

ADDITIONAL KNOWLEDGE FOR MERIT

UNIT: 12 Nutrition

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

UNIT: 13 Molecular biology

- Molecular biology (In brief) : Nucleic acid metabolism, Replication, Transcription, Translation, DNA recombinant technology, Blot techniques, PCR

REFERENCES

- 1) P. Godkar. *Text Book of Bio Chemistry for Medical Laboratory Technician*.
- 2) Vasudevan D. & Sree Kumari S., *Text Book of Bio Chemistry for Medical Students*, Jaypee Brothers, New Delhi.
- 3) Teitz, *Clinical Chemistry*. W.B. Saunders Company Harcourt (India) Private Limited New Delhi.
- 4) U. Satyanarayan ,*Biochemistry*, Books and Allied (P) Ltd. Kolkata-India
- 5) Das Debajyothi, *Biochemistry*, Academic Publishers Calcutta.

DMLT-2: GENERAL & CLINICAL MICROBIOLOGY

Course Hours (Theory): 60 hrs

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

ADDITIONAL KNOWLEDGE FOR MERIT

- Blood
- CSF and other body fluids
- Hospital-acquired infections & Laboratory Hazards
- Disposal of Biomedical waste
- Quality control in Diagnostic Microbiology
- Automation in Diagnostic Microbiology

DMLT-3: CLINICAL PATHOLOGY & HISTOPATHOLOGY

Course Hours (Theory): 60 hrs

CLINICAL PATHOLOGY

MUST KNOW

- Urine analysis: Physical, Chemical and Microscopic
- Stools analysis: Physical, chemical & microscopic
- Body fluids analysis (ascitic, pleural, pericardial, synovial, CSF, CAPD, Drain)
- Semen analysis

ADDITIONAL KNOWLEDGE FOR MERIT

- Quality control in Clinical Pathology

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.
- Use of microtome, Microtome knives and methods of sharpening. section cutting
- Staining : principle of staining, preparation and use of Hematoxyline and eosin stain and other special stains and immunohistochemistry(IHC) stain.
- Mounting,
- Frozen sections preparations like fixation, cutting ,staining and mounting
- Diagnostic Cytology preparation of smears and Papanicolaou stain.

ADDITIONAL KNOWLEDGE FOR MERIT

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

DMLT-4: HEMATOLOGY AND BLOOD BANKING

Course Hours (Theory): 60 hrs

HEMATOLOGY

MUST KNOW

- Blood sample collection
- 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 stain and diluting fluids
- Study of peripheral 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. Fetal Hemoglobin
- Hemoglobin electrophoresis.
- Basics of automated Blood Cell counters

ADDITIONAL KNOWLEDGE FOR MERIT

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

BLOOD BANKING

MUST KNOW

UNIT 1:- Blood Grouping

- Human Blood Group ABO system- Subgroups- Red Cell Antigen- Natural Antibodies, Cell grouping, Serum grouping
- Human Blood Group Rh System- Rh Antigens & Rh Antibodies- Hemolytic Disease of Newborn & Prevention- Principal of Blood grouping,
- Antigen-antibody reaction-Agglutination,Haemagglutination,

UNIT 2: Blood Transfusion

- Principal & Practice of blood Transfusion-Blood Transfusion service
- Guide lines for the use of Blood components
- Quality Assurance
- Autologous Blood Transfusion practices
- Standard operating procedures for usage, donation & storage of blood, screening of donor, compatibility testing, safety, procurement of supplies.

UNIT 3: Blood Donation

- Blood donor - Criteria for selection & rejection,Medical history & personal details,Self-exclusion,Health checks before donating blood,Screening for TTI, Instructions given to the donor after blood donation
- Blood Collection -Blood collection bags ,Anticoagulants ,Techniques of collecting blood by a doctor, Adverse reaction to donor

UNIT 4: Testing Donor Blood

- Screening donor's blood for infectious agents - HIV, HCV, HBV, Trepanoma palladium, Plasmodium.

UNIT 5: Blood Bank Records

- Blood donation record book-Recording results- Blood donor card- Documentation in blood bank- Types of documents.

- Blood bank temperature sheet.
- Blood bank stock sheet.
- Blood transfusion request form
- Record Maintenance- Period of record archival- Process information by compiling, coding, categorising, calculating, tabulating, auditing or verification of data- The standard protocol for documenting the data in the patient's files and in the computer for future records
- Evaluate the completeness of patient data
- Monitor quality control data to rapidly identify analytical deficiencies
- Document errors and note the remedial actions they have taken

UNIT 6: Storage, preservation & Transport of blood

- Storage of Blood and its components - Whole Blood - Platelets - Leucocytes - Plasma - Fresh Frozen Plasma- Anticoagulant & Preservatives — Whole Blood
- Red Cells - Frozen State - High glycerol solution. - Low glycerol solution.
- Changes in blood after storage-labelling of blood units-Gas refrigerator
- Lay out of a blood bank refrigerator Packing and Transportation.

UNIT 7: Compatibility Testing

- Purpose - Single tube compatibility techniques using AHG reagent , Colum agglutination technology
- Difficulties in cross matching
- Labeling & Issuing cross- matched blood.

UNIT 8: Blood Components

- Collection of blood components for fractional transfusion-Platelets packed Red Cell, Platelet rich Plasma, Platelets concentrate-Preparation of concentrated (packed) Red cells
- Techniques of components preparation.
- Blood component Apheresis

Module 9: Blood Transfusion Reactions

- Investigation of a Transfusion reaction-Hemolytic transfusion reaction-Actions to take when transfusion reaction occurs.

ADDITIONAL KNOWLEDGE FOR MERIT

- Blood transfusion reactions
- Quality control in Blood Banking

LIST OF PRACTICALS

DMLT-1: CLINICAL BIOCHEMISTRY

Course Hours (Practical): 300 hrs

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. Estimation of total cholesterol and its fractions
8. Estimation of calcium
9. Estimation of phosphorous
10. Estimation of Creatinine
11. Estimation of urea
12. Estimation of uric acid
13. Estimation of AST
14. Estimation of ALT

15. Estimation of alkaline phosphatase
16. Estimation of Bilirubin , direct , total
17. Auto analyzers
18. Electrolyte analyzer
19. Arterial blood gas analyzer
20. Chemiluminascence equipment
21. Spectrophotometer

Nice to acquire:

1. Estimation of iron and TIBC
2. Chromatography

DMLT-2: GENERAL & CLINICAL MICROBIOLOGY

Course Hours (Practical): 300 hrs

Students should be able to perform:

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 suceptibility testing e.g. Kirby-Bauer,
9. Collection of specimens for Microbiological investigations such as Blood, Urine, Pus (Swabs),fluid (pleural pericardial , ascetic, csf and synovial.)
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 CO₂ and H₂.
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, ASO TITRE
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
2. 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:

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

Virology

Must acquire

1. Serological tests – ELISA for HIV, HBsAg, HCV
2. RPHA for HBsAg, Haemagglutination Inhibition for Influenza, and Haemadsorption for parainfluenza.
3. Chick Embryo techniques – inoculation and harvesting.

DMLT-3: CLINICAL PATHOLOGY & HISTOPATHOLOGY

Course Hours (Practical): 300 hrs

CLINICAL PATHOLOGY

Must acquire

1. Urinalysis- Physical and chemical analysis, Sediment preparation
2. Stool Examination
3. Examination of Body fluids
4. Semen Analysis

HISTOPATHOLOGY & CYTOLOGY

Must acquire

1. Preparation of fixatives
2. Specimen Collection and Preparation
3. Processing Of the Tissues Including Bone
4. Paraffin embedding
5. Handling and embedding of tiny tissue biopsies
6. Paraffin section cutting
7. Staining Procedure and Mounting
8. Haematoxylin and eosin staining
9. Pap Staining
10. Special stains (principle & use)- PAS staining, Reticulin stain, Silver stain, Trichrome stain, Congo red stain, AFB staining (TB and Leprosy), Van gieson, iron stain, Melanin bleach
11. Immunohistochemistry(IHC) stain.
12. Frozen section technique
13. Preparation of Fluids for Cytological Examination
14. Museum techniques- Preparation of mounting medium & mounting of specimen

DMLT-4: HEMATOLOGY AND BLOOD BANKING

Course Hours (Practical): 300 hrs

HEMATOLOGY

Students should be able to perform:

1. Collection of Blood
2. Preparation of bulbs for collection
3. Blood cell counter
4. Estimation of Hemoglobin
5. Microscopy
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. Bleeding time & Clotting time
15. Sickling tests

BLOOD BANKING

1. Donor Hb estimation
2. Donor phlebotomy
3. Blood Group- ABO(Cell and serum grouping)and Rh system
4. Cross Match Tests
5. D^u Tests
6. Antibody titre
7. Direct and indirect agglutination tests (Comb's Tests)
8. Cold and Warm agglutinin tests
9. Component preparation

SUGGESTED BOOKS :

- Dr. Praful B. Godkar, Text Books of Medical Laboratory Technology
- Anathanarayana & Panicker – 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