REVISED SYLLABUS

For

DMLT

(Diploma in Medical Laboratory Technology)

Lal Bahadur Shastri Paramedical Skill and Training Council India

लाल बहादुर शास्त्री पराचिकित्सीय कौशल एवं प्रशिक्षण परिषद भारत

मुख्य कार्यालयः– 4 वीं मंजिल, प्राइम प्लाजा, इन्दिरा नगर, लखनऊ।
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वेबसाइटः– www.lbspstc.com संपर्क सूत्रः– 121– 4349311

Exam: March and April

(To be implemented from 2024-25 session)

Syllabus of Diploma in Medical Laboratory Technology

FIRST YEAR (1st)

S. No.	Subjects	Distribution of Marks			
		TH	PR	Viva-voce	Total
Paper I	Communication skills in English	100	-	-	100
Paper II	Anatomy and Physiology	100	-	-	100
Paper III	Hematology and blood Banking	100	-	-	100
Paper IV	Clinical Pathology	100	-	-	100
Paper V	Computer Application	100	-	-	100
PRAC	Clinical Practical Training		300	100	400
PRAC	MLT Instruments Practice Lab-1		25+25(50)	25+25(50)	100
PRAC	Hospital Industrial Training		25+25+25+25		100
	Total				**1100**

Syllabus of Diploma in Medical Laboratory Technology

SECOND YEAR (2nd)

S. No.	Subjects	Distribution of Marks			
		TH	PR	Viva-voce	Total
Paper I	Entrepreneurship and Professional Management	100	-	-	100
Paper II	Microbiology including parasitology and immunology	100	-	-	100
Paper III	Pathology	100	-	-	100
Paper IV	Biochemistry	100	-	-	100
PRAC	Clinical Practical Training-II		300	100	400
PRAC	MLT Instruments Practice Lab- II		25+25(50)	25+25(50)	100
PRAC	Hospital Industrial Training		25+25+25+25		100
	Total				**1000**

FIRST YEAR (1ST Year)-DMLT

Paper-I Communication Skills in English

RATIONALE

The students seeking admission to the diploma course do not have the required proficiency in English. It has, therefore, been decided to introduce English and Communication Techniques to help them to attain proficiency in the subject.

CONTENTS

i. Narration, Voice, Basic Sentence patterns. (Nine Basic Statements patterns).

ii. Transformation, Sentence, Determiners, Preposition.

iii. Tenses, Common Error (Noun, Pronoun, Articles, Adverb, Punctuation, Preposition etc.)

iv. Modals in conversational usages, prefix, suffix, idioms and phrasal verbs.

Modals: -

Can/Could/Should: will/Would/May/Might/: Must/Need/Not; Dare not/ought/ to/ use to.

Phrases:

At all; instead of; in spite of; as well as; set up; upset; look up; call off; call out; come across; set right; look other.

Idioms:

workup (Excite); Breakdown; stand up for; turn down; pass away; pass on; backup; back out; carry out; done for (Ruined); bring about; go through; ran over; look up (lmprove); pick out (Selected).

v. Letter writing, paragraph writing, Report writing

REFERENCE BOOKS

a)	Intermediate English Grammer	Raymond Murphy Pub: Foundation Books, New Delhi
b)	Eng. Grammer, Usage & composition	**Tickoo & Subramanian** Pub: S Chand and Co. **Standard Alien** Pub: Longman
c)	Living Eng, Structure:	**Standard Alien,** Pub: Longman
d)	A Practical Eng. Grammer: and its Exercise Books	Thomson and Martinet.

Paper II Anatomy and Physiology

RATIONALE

The study of basic anatomy and physiology is essential because it will help in understanding the normal basic function structure may of the human body and normal function in health. During disease the likely to be affected. By various laboratory tests, the student will be able to know the abnormal functioning of the body and ultimately help in diagnosis of the disease.

CONTENTS

1) Anatomy and physiology of the human body.

- ✓ Cells: Structure and function
- ✓ Tissues: Epithelial, Muscular, Connective (cartilage and bone) and necrosis,
- ✓ Blood
- ✓ Circulatory system
- ✓ Digestive system
- ✓ Respiratory system
- ✓ Nervous system
- ✓ Endocrine system
- ✓ Urinary system
- ✓ Ear, Nose, Tongue and skin.
- ✓ Skeletal system
- ✓ Muscular system
- ✓ Reproductive system

REFERENCE BOOKS

a)	Medical laboratory manual for tropical: Countries Vol. l & ll	Monica Chesbrough ELBS Edition
b)	Practical Microbiology	**Prof. C.P. Baveja** Arya Publications, New Delhi

Paper- III Hematology and blood Banking

RATIONALE

Hematology and blood banking are very important branches of laboratory medicine. The student will be able to know the basic components of blood and their significance in normal health, by examination of blood, various types of diseases can be diagnosed.

CONTENTS

Clinical pathology and quality Control

Clinical Pathology

- ✓ Introduction to clinical pathology & safety measures in lab
- ✓ Quality control – Internal and external.
- ✓ Urine analysis.
- ✓ Collection, composition, preservation and gross examination of urine
- ✓ Chemical and microscopic examination of urine.
- ✓ Cerebrospinal fluid (CSF) examination.
- ✓ Examination of other body fluids
- ✓ Semen analysis.
- ✓ Norms of biomedical waste and discarding of infected brood

Hematology

Introduction to clinical hematology, instruments and glassware's used in hematology washing of laboratory glassware. Preparation of various stains, buffers and other solution used in hematology. Methods of collection of blood sample and anticoagulants used in different tests and various types of vacutainers.

- ✓ Red blood cell counting.
- ✓ White blood cell counts and absolute eosinophil count.
- ✓ Platelet and reticulocyte count.
- ✓ Methods of hemoglobin estimation, their merits and demerits.
- ✓ Packed cell volume.
- ✓ Blood indices.
- ✓ Erythrocyte sedimentation rate.
- ✓ Preparation and staining of peripheral blood smear.
- ✓ Preparation and staining of peripheral blood smear.
- ✓ Morphology of normal and abnormal forms of RBC's
- ✓ Morphology of normal and abnormal forms of Leucocytes.
- ✓ Differential Leucocyte count.
- ✓ Bone marrow examination – Different sites and needles used.

- ✓ Osmotic fragility test
- ✓ Estimation of foetal hemoglobin.
- ✓ G6PD Estimation.
- ✓ Sickling test.
- ✓ Automation in Hematology -Basic principals

Blood Banking

- ✓ Screening and selection of donor.
- ✓ Collection and storage of blood.
- ✓ Blood grouping – A B O RH, and other systems of blood groups, sub group of A, Bombay group, Antibodies to ABO system, Anti AB and Anti H antibody.
- ✓ ABO testing slides and tube test, reverse grouping, discrepancies between cell and serum results, sources of error, rouleux formation and methods of checking it.
- ✓ RH grouping test slide or rapid tube test false – positive and false – Negative results, Du system & its significance.
- ✓ Cross matching, reasons of cross match, saline, albumin, combs and enzymes in testing.
- ✓ Coombs test- Directed and indirect, principle, explanation of procedure and sources of error control, interpretation and clinical application.
- ✓ Preparation of various components of the brood and their storage.
- ✓ Grouping and cross matching by Gel techniques.

REFERENCE BOOKS

a)	Medical laboratory manual for tropical: Countries Vol. l & ll	Monica Chesbrough ELBS Edition
b)	Medical Laboratory technology: A procedure manual for routine Diagnostic Tests Vol l, ll, ll	**Kanai L. Mukharjee** TATA Mc Grow – Hill Pub New Delhi
c)	Dacie and lewis: Practical Hematology	**S.M. Lewis** **B.J. Jain** 1. Bates Churchil Livingstome
d)	De Gruchy's :	**Frank Firlin**

Paper- IV Clinical Pathology

RATIONALE

It helps in monitoring the normal functioning of different systems of hymen body abnormal clinic-pathological results give a clue regarding a disease process going on inside the body.

CONTENTS

- ✓ Complete urine examination,
- ✓ Semen analysis.
- ✓ CSF and other body fluids examinations
- ✓ Blood cell counts including reticulocyte count
- ✓ Hemoglobin estimation, Hemoglobin electrophoresis.
- ✓ Determination of PC; ESR and blood indices
- ✓ L.E. cell test, test for cold agglutination.
- ✓ Preparation and staining of peripheral blood and bone marrow smears.
- ✓ Differential leucocyte count.
- ✓ Osmotic fragility test
- ✓ Sickling test
- ✓ Foetal hemoglobin estimation
- ✓ G6PD estimation.
- ✓ Blood grouping and cross matching
- ✓ Organization of blood bank, separation and uses of various components of blood.
- ✓ Transfusion reactions.

REFERENCE BOOKS

a)	Medical laboratory manual for tropical: Countries Vol. l & ll	Monica Chesbrough ELBS Edition
b)	Medical Laboratory technology: A procedure manual for routine Diagnostic Tests Vol l, ll, ll	**Kanai L. Mukharjee** TATA Mc Grow – Hill Pub New Delhi
c)	A color atlas of practical pathology and Microbiology	**Remnik Sood** J.P. Brothers, New Delhi

Paper -V Computer Application

RATIONALE

The course has been designed to provide an introduction to computer technology and its tools' The student will be able to understand the basics of computer and its application. The student will be able to appreciate the role of computer technology, more specifically computer hardware, software and its application in the present social and economic scenario.

The course has focus on the following: -

- ✓ Computer organization.
- ✓ Computer operating systems and software.
- ✓ MS Windows, Word processing.
- ✓ Presentation packages.

CONTENTS

Computer Application, Characteristic of computers, input, Output, Storage units, CPU Computer systems.

- ✓ Computer Organization.
- ✓ Central processing unit
  - ➢ Memory
  - ➢ Input Devices
  - ➢ Output Devices
  - ➢ Computer Software
- ✓ Operating systems
- ✓ Word Processing
- ✓ Presentation package (power point)

REFERENCE BOOKS

a) "Foundation of computing, First" P.K. Sinha

b) "Microsoft office 2000 for window, **S. Sagman**

PRAC- Clinical Practical Training

RATIONALE

It is very important for a medical laboratory trainee to have practical knowledge of various laboratory tests. The student will be able to interpret correctly the test results and correct diagnosis of a disease.

CONTENTS

Practical related to theory papers i.e. Basic Anatomy & Physiology, Hematology and blood banking and clinical pathology.

PRAC- MLT Instruments Practice Lab-1

RATIONALE

This is a practice – oriented laboratory in which the student will be given hands – on experience of the equipment used in the laboratory. After undergoing the practical's, the student will be able to handle the equipment properly and he/she will be able to repair and maintain the equipment used in the laboratory.

CONTENTS

- ✓ Introduction to equipment
- ✓ Simple usage
- ✓ Indication and contraindications use
- ✓ Repair and maintenance of equipment used in laboratory

SECOND YEAR (2nd Year)-DMLT

Paper-I Entrepreneurship and Professional Management

RATIONALE

As the opportunities for wage employment are reducing day by day, Govt. of lndia and state Govt' directed to develop entrepreneurship among the students, Entrepreneurship training is essential to make aware the students of different branches of diploma course about the scope of employment outside the Govt. Sector.

It will equip them with the necessary skills and training for setting up a small-scale enterprise in their own area of study. This course includes the procedure how to select, proceed and start the small enterprises.

To achieve the targets and goals in an organization, it is essential to co-ordinate the entire system. For this the knowledge of principles of management, personnel, management……. Management is required.

CONTENTS

1. Entrepreneurship
   - ☑ Definition, basic concept, need, scope and characteristics of entrepreneurship.
   - ☑ Women entrepreneurship
   - ☑ Assistance to small scale enterprises from national level organizations like SlDO, NSIC, NRDC, KVIC.
   - ☑ Assistance to small scale enterprises from state level organizations like DOl, DlG, women RTC' SlSl' RHDC, Pollution control board, Rajasthan Khadi and village industries to entrepreneurs,
   - ☑ Facilities to women entrepreneurs.
2. Emerging Areas in Entrepreneurship
   - ☑ Innovation and creativity
   - ☑ Introduction to intellectual property rights (IPRs) & patents
   - ☑ National Knowledge commission, Basic concept need and scope.
   - ☑ Service sector: Scope and future trends.
   - ☑ Energy and auditing
3. Project Formulation process
   - ☑ Steps in planning a small-scale enterprise.
   - ☑ Structure of project report.
   - ☑ Analysis of sample, project reports.
   - ☑ Preparation of project reports.
   - ☑ Techno-economic and feasibility of the project

4. Rules and Regulations

- ☑ Licensing and registration procedure
- ☑ Important provisions of Factory Act.
- ☑ Shop and commercial Establishment Act.
- ☑ Sales of Goods Act.
- ☑ Partnership Act
- ☑ Value Added Tax (VAT)
- ☑ Service tax
- ☑ Professional Tax
- ☑ Income tax
- ☑ Sales tax and Excise Rules
- ☑ Municipal bye laws and insurance coverage.
- ☑ Introduction to equipment

5. Meaning and scope business

- ☑ Definition of profession, trade and industry.
- ☑ Objective of business and profession.
- ☑ Types of business organization
- ☑ Brief description, advantage and disadvantages of individual-partnership-cooperative private and public-limited organizations.
- ☑ Characteristics of small business ethics, organization charts.

6. Management Techniques

- ☑ Leadership authority, responsibility
- ☑ Functions of management.

7. Financial Management

- ☑ Sources of Finance
- ☑ Brief idea of cash and Credit, Cheques, Drafts, Bill of exchanges, promissory note.

8. Marketing

- ☑ Basic concept
- ☑ Market promotion
- ☑ Branching, packaging, pricing planning and development
- ☑ Advertisement media and effectiveness
- ☑ Sales forecasting marketing fix-pricing policy, Sales promotion and salesmanship
- ☑ After sales service, complaints and their redressal.

Paper II Microbiology

Including parasitology and immunology

RATIONALE

A large number of diseases are caused by infections organisms, The microbiology and parasitology give knowledge of various infections agents and their role in different infectious diseases. immunology deals with immune system and its role in normal health and various diseases.

CONTENTS

1- Human parasitology

- ☑ Protozoa- classification, morphology life cycle (Diagrammatic) and lab diagnosis (short)

  E. Histolylica, giardia intestinalis, malarial parasite, trichomonas, leishmania, trypanosome, toxoplasma.

2- Nematodes

- ☑ Classification, morphology life cycle (Diagrammatic) and lab diagnosis (short) ascaris, ankylostoma duodenale, enterbius, vermicularis, trichuris, strongyloides, dracunculuS, ...,., wuchereria, banacrofti, onchocerea.

3- Platyhelinthes

- ☑ Classification - Names with general outline, morphology, life cycle (Chart)
- ☑ Lab Diagnosis (Short)
- ☑ Teaenia solium
- ☑ Taenia saginata
- ☑ Hymenolepis nana

4- Systemic bacteriology

- ☑ Morphology, culture, identification and laboratory diagnosis
  - ➢ Gram positive cocci - staphylococci, streptococci, preumococci,
  - ➢ Gram negative cocci – Neisseria
  - ➢ Gram negative bacilli - classification of enterobacteriraccae.
- ☑ Morphology
- ☑ Culture
- ☑ Biochemical diagnosis.
- ☑ Laboratory diagnosis
- ☑ Coli, klebsiella, Enterobacter, proteus, salmonella, shigella, vibrio, Pseudomonas.

5- Fastidious

- ☑ Haemoplilus
- ☑ Gram positive bacilli

- Morphology, culture, biochemical identification and lab diagnosis.
- Corynebacterium.
- Clostridium
- Bacillus

☑ Spirochaetes - Morphology and serological

☑ diagnosis) Mycobacteria - Morphology classification Identification by biochemical tests.\

6- Virology

☑ General character with classification

☑ Human immune deficiency virus

☑ Hepatitis viruses.

7- Immunology

☑ Antigen antibody reaction-Principles and practical application of various types of serological tests - Precipitation, agglutination, complement fixation test, neutralization, ELISA, Radio immimo assasy, ceectrophoresis, immunofluorescence, polymerase chain reaction (in short).

☑ Hyper sensitivity - Definition and type only.

REFERENCE BOOKS

a)	Medical laboratory manual for tropical: Countries Vol. l & ll	Monica Chesbrough ELBS Edition
b)	Medical Laboratory technology: A procedure manual for routine Diagnostic Tests Vol l, ll,	**Kanai L. Mukharjee** TATA Mc Grow – Hill Pub New Delhi
c)	Practical Microbiology	**Prof, C.P. Baveja** Arya Publications, New Delhi

Paper- III Pathology

RATIONALE

In health different body systems and / or parts work normally, however, during disease process' normal structures and functions of body parts may be altered pathology deals with all abnormal changes taking place inside the body during disease.

CONTENTS

- ☑ Histopathology
  - General principles of histo-pathological work: Collection of specimen, numbering and giving tissue bits.
  - Equipment's used in histopathology, their merits & demerits and care to be taken.
  - Fixatives used in histopathology - Preparation, advantage and disadvantages.
  - Frozen section and cryostat technique, staining and mounting, morbid anatomy.
  - Decalcification - Methods, advantages and disadvantages of each method.
- ☑ Cytology
  - Introduction of cytopathology, methods of collection of materials makes smears and preparations of fixatives used.
  - Different stains used, their preparation and staining the smears.
  - Demonstration of Barr- Bodies (Sex Chromatin).
- ☑ Hematology
  - Investigation of breeding disorders - Normal coagulation cascade.
  - Bleeding time and clotting time, methods and interpretation.
  - Clot retraction time.
  - Prothrombin time.
  - Activated partial thromboplastine time.
  - Thrombin time
  - Fibrinogen degradation products (FDP).
- ☑ Museum techniques
  - Preparation of specimen for mounting
  - Preparation of fixatives for mounting.
  - Techniques of mounting.
  - Organization of medical laboratory and museum and their maintenance.

REFERENCE BOOKS

a)	Medical laboratory manual for tropical: Countries Vol. l & ll	Monica Chesbrough ELBS Edition
b)	Medical Laboratory technology: A procedure manual for routine Diagnostic Tests Vol l, ll,	**Kanai L. Mukharjee** TATA Mc Grow – Hill Pub New Delhi
c)	Manual of basic techniques for a health Laboratory	**WHO Publication,** World health Organization, World health house, Indraprastha Estate, Ring Road, New Delhi-110002

Paper- IV Bio-chemistry

RATIONALE

Bio-chemistry imparts knowledge of basic chemical components i.e. carbohydrates, proteins, lipids, vitamins, minerals etc. which are very important for various biochemical reactions going on in human body. Disturbance in various normal biochemical reaction may result during disease process, Therefore, their study helps in diagnosis of disease.

CONTENTS

- ☑ Digestion, absorption and assimilation of carbohydrates, blood sugar, regulation of blood sugar glycolysis, TCA, cycle, glycogenesis, glycogenolysis, GTT, metabolic disease associated with carbohydrate metabolism, diabetes mellitus, glycated hemoglobin.
- ☑ Digestion, absorption of proteins, amino acids, urea formation, formation of creatinine, metabolic, disorders associated with amino acid metabolism, electrophoretic separation of proteins.
- ☑ Digestion and absorption and assimilation of lipids, ketone, bodies formation metabolic disorders associated with lipids, cholesterol and lipoprotein metabolism.
- ☑ Metabolic disorders associated with nucleic acid metabolism, gout etc.
- ☑ Kidney Functions tests, urine formation, formal and abnormal constituents
- ☑ Liver function tests and different type of jaundice.
- ☑ Cardiac profile tests application and significance.
- ☑ Pancreatic enzymes and diagnostic importance.
- ☑ Chemistry of blood, composition and importance of different constituents, hemoglobin ..... biosynthesis, porphyries.
- ☑ Constituents of gastric juice and diagnostic importance.
- ☑ Principles of special investigation like RIA, ELISA and chemiluminescence.
- ☑ Normal values, normal range, interpretative clinical chemistry, quality controls internal and - external.
- ☑ Automation in clinical investigation - Auto and semi analyzers, continuous flow analyzers, discrete analyzers, batch analyzers random access auto analyzer, dry chemistry analyzers - Reagents kits.
- ☑ Recording of patient's date, reporting values, preparation of investigation, statistics.

REFERENCE BOOKS

a) Medical laboratory manual for tropical: Countries Vol. l & ll — Monica Chesbrough, ELBS Edition

b)	Medical Laboratory technology: A procedure manual for routine Diagnostic Tests Vol l, ll,	**Kanai L. Mukharjee** TATA Mc Grow – Hill Pub New Delhi
c)	Manual of basic techniques for a health Laboratory	**WHO Publication,** World health Organization, World health house, Indraprastha Estate, Ring Road, New Delhi-110002

PRAC-Clinical Practical Training-II

RATIONALE

Practical training is very essential because it gives detailed practical knowledge regarding various tests of that trainees will be able to judge the importance of the tests in diagnosis of various diseases.

CONTENTS

Practical training related to i.e. microbiology including parasitology and immunology, pathology and bio-chemistry. In ll year trainee should be made to associate with senior technicians in conducting all the investigation of the laboratory trainee should be exposed to all sections of the laboratory. The candidate must estimate following, analyses himself glucose, urea, creatinine, uric acid, calcium, phosphorus, iron, TlBC, Total protein, albumin, bilirubin (Direct/indirect) triglycerides, cholesterol, RDL cholesterol, HDL, cholesterol, SGOT, SGPT, Alkaline phosphatase, acid phosphatase, LDH, CPK, CK-MB, GGT, Electrolytes by Falme.... and ISE, Blood gas analysis, estimation of hormones by ELISA (insulin, ..., Estimation of GHB.

Biochemical examination of pathological urine.

Biochemical examination of body fluids - CSF, pleural, ascitif fluid.

Candidate must be given practical training in clinical biochemistry lab.

- ☑ Hanging drop preparation
- ☑ Biochemical reaction - Inoculation and interpretation,
- ☑ Antibiotic sensitivity tests
- ☑ Collection of blood for culture sensitivity.
- ☑ Collection of skin scrapping for fungus
  - ➢ KOH and lactophenol preparation.
  - ➢ Inoculation of sabourauds
  - ➢ Rapid serum test.
  - ➢ Sugar fomentation and assimilation.
  - ➢ Slide culture.
  - ➢ Stool preparation- saline and iodine to study morphology of ova and cyst.
- ☑ Serological tests - Widal, CDRL, Latex agglutination, ELISA.
- ☑ Safe disposal of hospital waste and management.
- ☑ Handling of experimental animals.
- ☑ Collection of blood from sheep, guinea pig, Rabin.
- ☑ Quality control measures
  - ➢ Tissue processing block making, section cutting and routine, H&E

staining.

- Different types of special staining in histopathology.
- Preparation of fixatives
- Preparation of stains for sections and smears.
- Paraffin embedding of tissues.
- Preparation of paraffin blocks.
- Honing of microtome razors
- Microtomy - preparation of sections
- Frozen section techniques - Demonstration.
- Preparation and fixation of smears for cytology.
- Hematoxylin and cosin staining.
- Mounting of museum specimen.
- Bleeding and clotting time.
- Substitution tests for factor Identification.
- Interpretation of clot retraction.
- Some of the special stains

REFERENCE BOOKS

a)	Medical laboratory manual for tropical: Countries Vol. l & ll	Monica Chesbrough ELBS Edition
b)	Medical Laboratory technology: A procedure manual for routine Diagnostic Tests Vol l, ll,	**Kanai L. Mukharjee** TATA Mc Grow – Hill Pub New Delhi
c)	Practical Microbiology	**Prof. C.P. Baveja** Arya Publications, New Delhi.

PRAC- MLT Instruments Practice Lab-2

RATIONALE

Since the trainee has to work on various laboratory instruments and equipment, he must have the basic knowledge and practical training about the different machines so that is case of any trouble during work, he/she will be able to correct and repair the faults.

CONTENTS

- ☑ Introduction the equipment.
- ☑ Simple usage.
- ☑ Indication and contraindications use
- ☑ Repair and maintenance of instruments.

REFERENCE BOOKS

a)	Medical laboratory manual for tropical: Countries Vol. l & ll	Monica Chesbrough ELBS Edition
b)	Medical Laboratory technology: A procedure manual for routine Diagnostic Tests Vol l, ll,	**Kanai L. Mukharjee** TATA Mc Grow – Hill Pub New Delhi