



ALL INDIA PARAMEDICAL COUNCIL

(REGISTERED WITH MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP GOVT. OF INDIA)

Diploma in Medical Laboratory Technology (DMLT)

Year I

Objectives of the Course		
<p>Diseases can be prevented and cured through proper analysis of the body symptoms such as body fluids. This course teaches the student various procedures of the lab and its proper reporting ethically, confidently, safely. They will also keep abreast of the research trends.</p>		
Paper I : Anatomy, Physiology		
Sr. No.	Topics	Hrs.
1.	Terminology used in Anatomy, Bones – Names and location. Basic orientation and organization of human body from cell to organ system	06
2.	Human cells and tissues – Muscle, blood, gland, bone, nerve, reproductive cells and tissues – Organization and their functions	15
3.	Directional references of human body	02
4.	Body cavities – Dorsal and ventral	02
5.	Skeletal System – Terminology, position, basic details. Joints – Terminology, types, structure	20
6.	Integumentary System – Terminology, basics	02
7.	Gastrointestinal System – Terminology, position, structure, parts and their functions. Digestive process, absorption and defaecation.	10
8.	Respiratory System – Terminology, position, structure, parts and their functions, breathing mechanism.	10
9.	Urinary System – Terminology, position, structure, parts and their functions, process of urine formation and voiding.	10
10.	Male Reproductive System – Terminology, position, structure, parts and their functions	05
11.	Female Reproductive System – Terminology, position, structure, parts and their functions,	05

	menstrual cycle.	
12.	Endocrine System – Terminology, position, structure, function and regulation of all hormones	10
13.	Brain and Spinal Cord – Terminology, structure, functions	05
14.	Blood – Terminology, composition, lymphatic details and clotting system.	05
15.	Sensory organs (eyes, ears, nose and tongue) – Terminology, functions.	10
16.	Cardiovascular System – Terminology, structure. Vessels entering and leaving the heart. Arterial and venous tree.	10
17.	Lymphatic System – Terminology, functions of WBCs, spleen, tonsils and lymph nodes	05
18.	Immune System – Terminology, components, mechanism of defense	05

Reference Books

1.	An Integrated Approach to Health Sciences	Colbert Bruce, Jeff Ankney, Joe Wilson, John Havrilla	Cengage Learning
2.	Human Physiology, Biochemistry and Basic Medicine	Laurence A. Cole, Peter R. Kramer	Elsevier
3.	Introduction to Human Anatomy and Physiology	Solomon. E.A.	Saunders: St Louis

Paper II : Microbiology

Sr. No.	Topics	Hrs.
1.	Introduction to Microbiology – Definition, history, classification and importance.	01
2.	Introduction to Bacteria – Structure, shape, anatomy, structure of cell wall, classification and nutrition of bacteria	03
3.	Bacterial Culture Media – Classification, composition, methods, growth curve	05
4.	Staining of Bacteria – Terminology, classification, special staining (Metachromatic granules, spores capsules, spirochetes and flagella)	05
5.	Sterilization and disinfection – Introduction to sterilization, disinfection, antiseptic, bacteriocidalagents, bacteriostatic agents, methods of sterilization (physical, chemical, dry	20

	heat,moist heat), filtration, radiation, autoclave, types of autoclave, commonly employed sterilization method for different clinical article, uses of disinfectant	
6.	Infection - Classification of infection,source of infection in man, method of transmission of infection	10
7.	Morphology and Pathogenicity of – a) Gram positive cocci-Staphylococci, Streptococci, b) Gram negative cocci- Neisseria c) Gram positive bacilli- Corynebacterium, Actinomy, Listeria, Bacillus, Clostridia, Mycobacterium tuberculosis and Mycobacterium leprae. d) Gram negative bacilli- Pseudomonas, Vibrio, Aerononas, Plesiomonas, Brucella, Haemophilus, Bordetella, Chlamydia, Spirochaetes, Rickettsia, Mycoplasm Salmonella, Shigella,Vibrio	10

Reference Books

1.	Text Book of Microbiology	Chakraborty	New Central Book Agency P Ltd
2.	Microbiology - An Introduction	by Tortora Funk	Pearson

Paper III : Biochemistry

Sr. No.	Topics	Hrs.
1.	Basics of Biochemistry –Terminology, introduction, units of measurement	05
2.	Basics of Biochemistry – Bioenergetics, thermodynamics	05
3.	Amino acids – Essential and non-essential with structure and function.	05
4.	Proteins – Structure (primary, secondary, tertiary, quaternary), functions, digestion and absorption of proteins (urea cycle and ammonia excretion).	08
5.	Lipids –Role, classification, digestion and absorption of lipids	05
6.	Fatty Acids – Essential and nonessential fatty acids and their role.	03
7.	Enzymes–Classification, coenzyme, enzyme action and various factors effecting, significance of enzymes	05
8.	Carbohydrates–Definition, sources, classification, carbohydrate metabolism (glycolysis- Kreb's cycle,	10

	glycogenesis, glycogenolysis, gluconeogenesis), insulin and glucagon, intolerance of lactose.	
9.	Vitamins–Classification (water and fat soluble with deficiency effects)	05
10.	Mineral – Major And Minor Minerals In Human Body (calcium, phosphorus, magnesium, iron, copper, zinc, fluoride, selenium, manganese)	08
11.	Hormone–Characteristics, various hormones and their functional importance.	10

Reference Books

1.	Text Book of Biochemistry	U Satyanarayana and Chakrapani	Elsevier
2.	Microbiology - An Introduction	by Tortora Funk	Pearson

Paper IV : Pathology

Sr. No.	Topics	Hrs.
1.	Introduction to Clinical Pathology – Terminology, branches, importance of each branch	03
2.	Haematology–Composition, formation and function of blood.	05
3.	Blood Collection–Collection and preservation of blood for investigation. Anticoagulants used in hematology	05
4.	Hematocrit –Methods of measurement, indices (PCV, MCV, MCH, MCHC)	05
5.	Anaemia – Meaning and its detailed classification	05
6.	Estimation of Haemoglobin–Structure of haemoglobin, estimation (Methods based on development of color, oxygen combining capacity and iron content)	10
7.	Morphology of blood cells and their identification.	08
8.	Erythrocyte Sedimentation Rate (ESR)–Methods of measurement, factors effecting, significance of measurement	08
9.	Urine Analysis –Collection and preservation, physical, chemical and microscopic examination.	05
10.	Stool Analysis –Macroscopic, microscopic and chemical examination	05
11.	CSF Examination –Cell count (Leucocyte, differential count), biochemical examination of CSF	05
12.	Semen Analysis –Collection of sample, physical	05

	properties, motility of spermatozon, morphological examination of spermatozon		
13.	Blood Banking –Techniques of blood collection, anticoagulants used in hematology, common aspects of immunohematology, 3 antigen antibody reactions, ABO blood group system	20	
14.	Rhesus Blood Group System–Antigens, significance of Rh typing, slide technique	05	
15.	Blood Transfusion –Pre-transfusion (compatibility testing), instructions, registration of donors, transfusion reactions, blood component transfusion	20	
16.	Histopathology –Introduction with terminology, grossing meaning, ways and importance, lab safety and hazards	10	
17.	Fixation – Aim, principles, types	05	
18.	Decalcification – Importance and methods	05	
19.	Tissue Processing–Meaning, importance and methods	05	
20.	Hematoxylin– Properties (progressive and regressive), preparation methods. Eosin – Methods of staining, staining methods to demonstrate special/ specific tissues	10	
21.	Cytology – Terminology, importance and introduction to fields of study.	05	
Reference Books			
1.	Robbins and Kumar Basic Pathology: First South Asia Edition	Kumar and Abbas	Elsevier
2.	Textbook of Pathology with Pathology Quick Review and MCQs	Harsh Mohan	Jaypee
3.	Textbook of Medical Laboratory Technology	RamnikSood	Jaypee
Lab –Anatomy & Physiology			
1.	Study of the human skeleton		
2.	Study with the help of charts and models of digestive system, respiratory system, ear, cardiovascular system, reproductive system, eye and urinary system		
3.	Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues		
4.	Examination of blood films for TLC.DLC and malarial parasite		
5.	Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin		

	Value
6.	Recording of body temperature, pulse, heart-rate, blood pressure and ECG
Note – The study of physiology and anatomy should be coordinated so that the structure and functions can be explained and understood clearly.	

Lab – Microbiology	
1.	Demonstration of a bacterial cell by simple staining.
2.	Demonstration of cell wall by slide.
3.	Demonstration of a eukaryotic cell by slide.
4.	Demonstration of a bacterial spore.
5.	Demonstration of flagella.
6.	Demonstration of inclusions bodies.

Lab – Biochemistry	
1.	Detection of protein from blood, urine etc.
2.	Detection of carbohydrates from blood, urine & other body fluid.
3.	Detection of amylase enzyme activity from saliva.
4.	Qualitative and quantitative tests for determination of carbohydrate.
5.	Qualitative tests for determination of protein.
6.	Qualitative tests for determination of fats.
7.	Enzyme assay for analysis of enzymes.
8.	Estimation of different serum enzymes like- AST, ALP, alkaline Phosphatase, acid Phosphatase, amylase, lipase.

Lab – Pathology	
9.	ABO blood grouping
10.	Rh Typing
11.	Coomb's test
12.	Blood, preservation and storage, recording the details and storage of blood
13.	Analysis of urine for routine and others tests
14.	Faeces occult blood test
15.	Total RBC Count

16.	Total and differential Leucocyte Count
17.	Total platelet count
18.	ESR
19.	Semen analysis



STATE PARAMEDICAL FACULTY

Diploma in Medical Laboratory Technology (DMLT)

Year II

Objectives of the Course		
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Paper II : Microbiology		
Sr. No.	Topics	Hrs.
1.	<p>Immunology– Introduction, definition, history, origin of cells, principle, functions.</p> <p>Organs involved in immune system (primary and secondary lymphoid organs), cells involved in immune responses (hematopoiesis, phagocytic cells and their killing mechanisms), defense mechanisms (innate immune system and adaptive immune system with properties and mechanism), nature of antigens and antibody, structure and functions of immunoglobulin's.</p> <p>Hypersensitivity – Meaning, classification and types of hypersensitivity reaction, immunodeficiency disorders, autoimmune diseases.</p> <p>Vaccines– Types of vaccines, immunological tolerance</p>	30
2.	<p>Serology – Introduction, techniques with principles, serological tests (WIDAL, VDRL, CRP, RF, ASO, Weil- Felix, pregnancy rapid card test).</p>	10
3.	<p>Bacteriology – Introduction, principles and methods in identifying an unknown organism, technique of specimen (pus, urine, stool, sputum, throat swab) examination.</p>	05
4.	<p>Infections –Introduction, microbes causing, factors causing emergence of infectious diseases</p> <p>Emerging and re-emerging infections – Definition, factors responsible, examples</p> <p>Defenses for infectious diseases – Common health measures, public health organizations</p>	05
5.	<p>Nosocomial Infection: Introduction, meaning, definition,</p>	20

	transmission, causes of epidemiology nosocomial infections, bacteriology surveillance.	
6.	Systemic Bacteriology –Introduction, gram positive cocci (staphylococcus aureus), neisseria (corynebacterium, bacillus, clostridium), non-sporing anaerobes, mycobacterium tuberculosis, spirochetes (mycoplasma).	20
7.	Virology – Introduction to virus (properties, structure, classification, life cycle, host virus interaction), morphology, pathogenesis, clinical syndromes, lab diagnosis of a few viruses (poliovirus, herpes virus, hepatitis B virus, HIV), structure and significance of bacteriophage.	20
8.	Mycology – Fungi (overview of fungal systematic and taxonomy, properties), parasitic fungi (moulds, yeasts, dimorphic mycotic agents) Classification of Fungal Diseases – Superficial mycoses, subcutaneous mycoses, systemic mycoses, laboratory diagnosis and prevention of fungal diseases.	20

Lab - Microbiology

1.	Widal Test..3.. 4.. 5.. 6.. 7.. 8.. 9.
2.	VDRL Test
3.	Determination of CRP
4.	ASO Test
5.	RA Test
6.	Pregnancy Rapid Card Test
7.	Rapid Detection of Hepatitis B Surface Antigen (HbsAg)
8.	Qualitative Determination of HIV 1/2 Antibody
9.	Examination of Sputum for TB.

Reference Books

1.	Really Essential Medical Immunology	Arthur Rabson, Iwan. M. Roit, Peter. J.	Wiley- Blackwell
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Paper I : Biochemistry		
Sr. No.	Topics Introduction – Scope,	Hrs.
1.	<p>importance.</p> <p>Cell – Organization, organic and inorganic components. Chemical composition of human, prokaryotic and eukaryotic cells with comparison between two.</p> <p>Ion Concentration and Buffers – pH, blood buffers, blood pH and its regulation, acid base metabolism, disorders of acid base balance.</p>	08
2.	<p>Water – Balance, functions, water intake (Exogenous and endogenous), water output, dehydration, distribution of fluids in the body, ECF & ICF.</p>	05
3.	<p>Electrolytes – Balance, electrolytic composition of body fluids, regulation of electrolyte balance, osmosis & application of osmosis. Mineral metabolism, macronutrients (principal mineral elements) & trace elements. Electrolyte analysis (calculation of anion gap, use of anion gap, electrolyte critical values).</p>	10
4.	<p>Carbohydrates – Sources in diet, digestion, absorption, and metabolism.</p> <p>Blood glucose – Importance, regulation (homeostasis of blood glucose), glucosetolerance test, glucocylatedHb, other parameters and related disorders, diabetes.</p> <p>Insulin, effects of insulin on glucose utilization, hormonal regulation of blood glucose (insulin, glucagon, epinephrine, thyroxin, glucocorticoids, growth hormone, ACTH, hypoglycemia (post prandial hypoglycemia, fasting hypoglycemia), hyperglycemia.</p>	10
5.	<p>Renal Function – Basic functions, creatinine metabolism, various renal failure, nephrotic syndrome, renal control of acid- base balance, renal tubular acidosis, kidney stones</p>	15
6.	<p>Organ Profiles – Kidney function test; Thyroid function test; Cardiac function test; Pancreas function test; Hypertension profile; Diabetic profile; Gastric function test.</p>	20
7.	<p>Liver Functions – Tests for liver function, bilirubin metabolism;</p> <p>Hyperbilirubinemia, obstructive jaundice including neonatal jaundice, hepatitis, pathophysiology of liver enzymes, analytical aspects of liver enzymes. Disorders related to proteins and amino acids,</p>	20

	interpretation of total serum protein levels.	
8.	Thyroid Disorders – Testing, EMIT (Enzyme-Multiplied Immunoassay Technique), old ways of thyroid testing; hyper and hypothyroidism.	15
9.	Therapeutic Drug Monitoring – Barbiturate phenobarbital, phenytoine, lithium, lead, salicylate, mercury, digitalist; buffer system importance of arterial blood gases.	15
10.	Radioactivity – Types of radioactive decay with examples, half-life, units, and applications of radioisotope in clinical chemistry.	10
11.	Detection of Drugs & Toxic Substances – Principles of chromatography; paper & thin layer chromatography, applications in detection of drugs & toxic substances.	20
12.	Cholesterol Estimation – Methods, principle, advantages and disadvantages of different methods.	10

Lab - Biochemistry

1.	Blood urea estimation
2.	Serum creatinine estimation
3.	Serum uric acid estimation
4.	Serum albumin estimation
5.	Serum glucose estimation
6.	Serum total protein estimation
7.	HDL cholesterol (direct) estimation.
8.	LDL cholesterol (direct) estimation
9.	Serum globulin estimation
10.	Total cholesterol estimation
11.	Triglyceride estimation
12.	Serum Bilirubin total estimation
13.	Serum amylase estimation
14.	Serum GOT (AST) estimation
15.	Alkaline phostase estimation
16.	Serum GPT (ALT) estimation
17.	Acid phosphatase estimation
18.	Serum sodium estimation
19.	Serum chloride estimation
20.	Serum potassium estimation
21.	CK-NAC estimation

Reference Books

1.	Clinical Biochemistry: An Illustrated Colour Text	Allan Graw, Michael J. Murphy, Rajeev Srivastava, Robert A. Cowan, Denis St. J.	O'Reilly
2.	Clinical Biochemistry	Nanda Maheshwari	

Paper III : Pathology		
Sr. No.	Topics	Hrs.
1.	<p>Introduction to Clinical Pathology – Importance, reception of patients (phlebotomy and aftercare of patients). Laboratory records, care of specimens, apparatus and equipment care. Cleaning of used and new glassware. Preparation of anticoagulants, reagents, buffers etc. and its uses. Testing level of significance, pathology, pathogenesis, disease diagnosis.</p>	08
2.	<p>Haematology– Composition, formation and function of blood.</p>	05
3.	<p>Blood Collection–Methods of collection of blood. capillary and arterial blood, blood buffers, serum, plasma (organic and inorganic components, plasma proteins), Haemoglobin – Definition, amino acid for buffering action of haemoglobin, porphyrin, types of haemoglobin, degradation of haeme to bile pigments. Characteristics and significance of multiple myeloma.</p>	20
4.	<p>Urine Analysis –Components (normal and abnormal constituents), nature. Hormones in urine formation, disease status, glycosuria – concept, transitory or persistent.</p>	15
5.	<p>Stool Analysis –Macroscopic, microscopic and chemical examination, containers involved</p>	10
6.	<p>CSF Examination –Indication, collection, container of body fluids, transport of sample, preservation. Fluid analysis – physical, chemical and microscopic examination and its significance.</p>	10
7.	<p>Semen Analysis –Collection of sample, physical properties, motility of spermatozon, morphological examination of spermatozoon, containers involved, transport and preservation.</p>	10
8.	<p>Blood Banking –ABO and Rh blood group system. Blood grouping, reverse grouping. Blood banking – Anticoagulants, cross matching, Screening test for incomplete antibodies (antiglobulin test, Coomb's test) Blood components – Preparation of blood components, requisition of blood, preparation of red cell suspension</p>	20

9.	Blood Transfusion –Pre-transfusion (compatibility testing), instructions, registration of donors, transfusion reactions, blood component transfusion	20
10.	Histopathology –Human tissues and their histological structure (epithelial tissues, connective tissues, muscle, and nerves). Human Organs – Histological structure of kidney, urinary bladder, heart, lungs, liver, stomach and skin; Biopsy specimens – Reception at laboratory, fixation of tissues, classification of fixing agents and mechanism of fixation, decalcification. Processing of tissues – Automated and manual tissue processing, paraffin embedding, and other techniques for embedding; Frozen section/cryostat – Use of Microtomes, selection and maintenance of knife, technique of section cutting and mounting on slide, staining of section slide.	30
11.	Cytology – Techniques, Cytopathology, fixation, pap staining, cytological processing of fluids, FNAC (Fine needle aspiration technology), Cytochemistry and immunohistochemistry	10
Lab - Pathology		
1.	Physical Examination of urine (colour, odour, reaction (pH), specific gravity), urine concentration test Estimation of urine for abnormal constituents (test for Albumin through sulfosalicylic, heat method and Heller's method). Estimation of proteins in urine using Esbach's albuminometer, calcium in urine Interpretation and indication of diseases (Glucosuria-Diabetes mellitus, Renal glycosuria, Pregnancy, alimentary glycosuria.	
2.	Qualitative test for Diacetic Acid (Gerhardt's test), Rothra's test, Heat test, Gerhardt's test.	
3.	Physical examination of CSF cell count (Sulphosalicylic test), Gross evaluation of CSF, Biochemical examination (sugar, protein, globulin – Pandy's test, Chloride).	
4.	Separation of Human Lymphocytes and preparation of Rosette forming cells from peripheral blood.	

5.	Identification of B and T–cells and Single Radial ImmunoDiffusion (SRID) Test (Mancini Technique)		
Reference Books			
1.	Guidelines for Good Clinical Laboratory Practices (GCLP)	Indian Council of Medical Research	
2.	Human Blood Groups	Daniels G.	Wiley

Paper IV : Social and Preventive Medicine		
Sr. No.	Topics	Hrs.
1.	Nutrition–Macro and micronutrients, trace elements, balanced diet, dietary goals and RDA, assessment of nutritional intake, nutritional deficiency, public health problem, food adulteration, protection and standards, public health acts related to food quality	10
2.	Medical Sociology – Behaviour, culture, role of family in health and disease, social security, psychology and social organizations	08
3.	Reproductive and Child Health – Introduction, to RCH, maternal health, new Born Care, child health, growth and development, indicators of maternal and child health care, school health programmes. Juvenile delinquency, child abuse, street children , refugee and displaced children, child labour, child trafficking, mission Indradhanush, global strategic measles and rubella plan	20
4.	Demographyand Related Indicators – Introduction, vital statistics, uses, fertility and mortality indicators, family planning measures, population stabilization	10
5.	Epidemiology– Introduction, measurements, study designs (basic, descriptive, case control, cohort and interventional studies, bias and confounding Disease Spread – Association and causation of disease, screening (types and their definitions), measurements in health and disease	20
6.	Environment – Meaning, theory of environment. Water (sources, water related diseases), air pollution (prevention and control), noise pollution (effects, prevention and control), radiation Communicable diseases – Infectious disease epidemiology, disease control, principles of disease prevention and control, acute respiratory illness, tuberculosis, malaria, dengue, filariasisandJE, acute diarrheal diseases, poliomyelitis, rabies, HIV/AIDS , small pox, chicken pox, measles, diphtheria, pertussis,tetanus. Emerging and re-emerging diseases – Influenza, ebola, zika, plague, leptospirosis, typhoid, cholera	30
7.	Non-communicable Disease (NCD) Epidemiology – Introduction, risk factors for NCD, diabetes mellitus, cardio-vascular diseases, HTN(HyperTension), IHD	15

	(Ischemic Heart Disease), stroke, cancers, blindness		
8.	Social and Behavioural Sciences – Clinico-social, cultural and demographic evolution of the individual. Humanities and Community Medicine – Social organizations with special reference to family religion, its evolution as a special instance of the evolution of social institutions, tenets of common religions in India and their influence on health and disease. Health economics social security in India, culture and its impact on health customs, taboos, medical social worker, doctor patient relationship		30
Lab - Social and Preventive Medicine			
1.	Nutrition and diet planning case scenarios		
2.	Immunization spotters		
3.	Family welfare measures and spotters		
4.	Integrated management of neonatal and childhood illness		
5.	Adolescent health		
6.	Fertility indicators, dependency ratios		
7.	Mortality indicator		
8.	Morbidity indicators		
9.	Sensitivity, positive predictive value, negative predictive value		
10.	Visit to sewage treatment plant		
11.	Visit to water works		
Reference Books			
1.	Fundamentals of social and preventive medicine	Barry Anthony Smithurst	University of Queensland Press
2.	A Handbook of Social and	Yash Pal Bedi	Anand Pub.

	Preventive Medicine		
	A Review of Preventive and 3. Social Medicine	Chandrakant Lahariya	Jaypee Brothers, Medical Publishers Pvt. Limited