D.M.L.T.

DEPARTMENT OF HEALTH, [MEDICAL EDUCATION, & INDIGENOUS MEDICINE] GOVERNMENT OF BIHAR, PATNA.

COURSE/CURRICULUM FOR 2 YEARS DIPLOMA IN MEDICAL LABORATORY TECHNICIAN COURSE

SCHEME OF EXAMINATION FOR DIPLOMA IN MEDICAL LABORATORY TECHNICIAN COURSE

First Year

THEORY				
Sl. No.	Subject		Full Marks	Pass Marks
1	Anatomy & Physiology		100	50
2	Principles of Common Clinico Biochemical method		100	50
3	Hematology		100	50
	Total Theory Marks		**300**	**150**
PRACTICAL				
4	A.	Practical	100	50
	B.	Viva	40	20
	Total Practical Marks		**140**	**70**

Second Year

THEORY				
Sl. No.	Subject		Full Marks	Pass Marks
1	Bacteriology & Virology		100	50
2	Serology and Mycology		100	50
3	Clinical Pathology		100	50
4	Histopathology and Animal Care		100	50
	Total Theory Marks		**400**	**200**
PRACTICAL				
5	A.	Practical	100	50
	B.	Viva	40	20
	Total Practical Marks		**140**	**70**

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Syllabus For Diploma in Medical Laboratory Technician Course

(ANATOMY & PHYSIOLOGY)

ANATOMY

1. Introduction to anatomy & histology, structure of cell, epithelial tissue, muscular tissue, nervous tissue.
2. Skeletal system, structure of bones, types of bones, bones of cranium,face vertebral column upper and lower limbs, fracture of bones, various movements of joints.
3. Muscular system, structure and types of muscles in human body, important muscles and their group action.
4. Circulation system, structure of heart, names and position of main blood vessels.
5. Lymphatic system, lymph vessels,lymph nodes and lymphoid organs, their structure & functions.
6. Digestive systems. Parts of gastrointestinal tract and associated glands.
7. Respiratory system. Parts of respiratory system.
8. Urinary system. Parts of urinary system.
9. Endocrine system. Various endocrine glands. Thyroid. Parathyroid. Adrenal glands pituitary pancreas. Thymus and sex glands.
10. Reproductive system. Male & female reproductive organs.
11. Skin and sense organs. Eye, ear, nose. Taste buds.
12. Nervous system. Parts of brain, spinal cord, peripheral nerves.

PHYSIOLOGY

1. Blood. Composition and function of blood, haemopesis, blood coagulation, blood groups, body fluid.
2. Cardiovascular systems. Circulation of blood, function of heart and blood vessels. Control of heart rate, pulse, regulation of blood pressure, blood volume.
3. Respiratory system. Function of lungs, mechanism of breathing and exchange of gases in the lungs, regulation of respiration, respiration disorder like anoxia. Dyspnea cyanosis etc.artificial respiration lung function tests.
4. Digestive systems. Digestion of food in mouth, stomach & small intestines. Absorption of food, function of liver function tests.
5. Excretory systems. Structure & function of kidney and urinary bladder. Mechanism of urine formation. Disorders of kidney.
6. Endocrine systems. Physiology & female reproductive organs.
7. Nervous system. Neurone & its functions, function of central nervous system. Autonomies nervous system, physiology of vision, hearing & olfaction.

Syllabus For Diploma in Medical Laboratory Technician Course

(PATHOLOGY, MICROBIOLOGY & BIOCHEMISTRY)

The course includes the respective subjects as given in the table below: the minimum number of hours to be devoted to each subject -lecture, practical shall not be less than those noted against them. The detailed syllabus of each subject is given in Appendix. .

Lectures:

1.	Elementary Principle of:		
	a. Chemistry	20}	
	b. Physical Chemistry	20}	
	c. Organic Chemistry	20}	With three months laboratory Work
	d. Elementary Biochemistry	06}	
2.	Principles of the common Clinico - biochemical Method	24	With six months laboratory work.
3.	Hematology.	20	With three months laboratory work.
4.	Bacteriology & Virology	25	With three months laboratory work.
5.	Serology	10	With one months laboratory work.
6.	Mycology.	10	With one months laboratory work.
7.	Clinical Pathology	10	With two months laboratory work
8.	Histopathology	20	With two months laboratory work
9.	Animal Care.	05	With one months laboratory work.

SYLLABUS

MICROBIOLOGY

1. The Microbial world and the structure of microbes.
2. Morphological variations and classification.
3. Physiology and growth requirements.
4. Principles of anaerobiosis and how to obtain anaerobiosis.
5. Sterilization - Principles and different methods adopted.
6. Disposal of laboratory waste.
7. Preparation of culture media.
8. Methods of inoculation of culture media from different samples.
9. Morphological identification of bacteria by colony characters, staining and motility test.
10. Biochemical tests and its interpretation.
11. Laboratory diagnosis of staphylococcal infection.
12. Laboratory diagnosis of streptococcal infection.
13. Laboratory diagnosis of Diphtheria.
14. Laboratory diagnosis of Tuberculosis.
15. Laboratory diagnosis of Typhoid and Bacillary Dysentery.
16. Laboratory diagnosis of Cholera.
17. Laboratory diagnosis of Meningitis.
18. Laboratory diagnosis of Septicemia.
19. Methods of colony count.
20. Bacteriology of water, milk and food.
21. Antibiotic Sensitivity Testing.

CLINICAL PATHOLOGY

1.	The Microscope	:	It's different parts and uses.
2.	Urine	:	Physiology of urine formation.
		:	Chemical examination of Urine for Protein, Sugar, Ketone bodies, Bile salts, Bile pigments and Blood.
		:	Microscopic examination of cells, casts, crystals and other deposits.
3.	Stool	:	Physical examination of colour, consistency and appearance. Chemical examination for occult blood.
		:	Microscopic examination for Protozoa, Parasites and Helminthic ova or cysts.
		:	A short account of the common Protozoa and Helminthics infesting the Alimentary system e.g. amoeba, giardia, thread worm, hook work, round worm.

4. Examination of Cerebrospinal fluid, Ascitic, Pleural fluid, Hydatid fluid.

5. Examination of Semen - Physical character, motility, count and sperm morphology.

HAEMATOLOGY

1. Composition of Blood and it's function.
2. Origin and development of blood cells.
3. Common Anticoagulants used - Their composition, amount, mechanism of action and methods of preparation of blood vials.
4. Method of counting of Red blood cells, Leucocytes and Platelets.
5. Method of estimation of Hemoglobin.
6. Method of determination of Packed Cell Volume.
7. Calculation of different Red Cell Indices.
8. Drawing of Peripheral Blood Smear, Bone Marrow slides and their staining methods.
9. Differential Leucocytes Count.
10. Reticulocytes staining and counting.
11. Erythrocytes Sedimentation Rate (ESR).
12. Blood Group (A B O & Rh) - methods of grouping and reverse typing.
13. Basic Blood Banking Procedures - collection of blood, anticoagulants used, storing of blood, cross matching, Coomb's Test for incomplete antibodies, different blood components in use and how to serve a requisition.
14. Basic tests for the Disorders of Coagulation - Bleeding Time, Clotting Time.
15. Prothrombin time. Some special test - L. E. Cell phenomenon, Red Cell Fragility, Abnormal HB.

SEROLOGY

1. Antigens and Antibodies - definition, different types preparation and preservation of antigens and antisera.

2. Types of Antigen - antibody reaction.
3. Diagnostic Serology - methods and interpretation of Widal, Brucella Agglutination Test, Well Belix, Kahn & Wassermann Reaction, Aldehyde Test, A. S. O. Titer, ELISA including demonstration of ELISA reader

BIOCHEMISTRY

1. Principles of Analytic Biochemistry - Colorimentry, Spectrophotometry, Flame photometry, Fluorimetry, Semiautoanalyser, ELISA, RIA.
2. Physical Chemistry - pH and Buffers, Radioactivity Electrophoresis, Chromatography.
3. Clinical Biochemistry - Specimen Processing for Biochemical Analysis, Chemistry, Principles, procedures, calculation and preparation of Standard Curve and result of estimation of Blood Sugar, Urea, NPN, Cholesterol, Triglycerides, Creatinine, Total Protein, Albumin - Globulin ratio, Bilirubin, Alkaline Phosphatase, SGOT, & SGPT.

HISTOPATHOLOGY

1. Basic tests Histological structure of mammalian tissues - Different types of tissues and different organs of Human beings.
2. Receiving of tissue for Histopathology.
3. Fixation of tissue - Different fixatives and their mode of action.
4. Methods of Decalcification.
5. Processing of Tissue - Protocol of Paraffin Embedding, Reagent used for manual and mechanical processing and embedding, different techniques and their application.
6. Use of Microtome - Selection and maintenance of knives, techniques and section cutting.
7. Staining of tissue sections - preparation of different stains, staining methods of Haemotioxiline and Eosin, P. A. S. reticuline, Mason's Van - Gieson, Staining of Lipid, Mucin.
8. Preservation of Specimen and Mounting for Museum.

ANIMAL CARE

1. Common Laboratory Animal - General knowledge about their food, housing, breeding, Handling etc.
2. For normal experimental animals - Cage sterilization, Disposal of infected materials.
3. Postmortem and disposal.

COURSE CONTENTS.

CLINICAL CHEMISTRY.

Outline & Guidance.

1. Carbohydrates.
2. Lipids.
3. Proteins & amino acids.
4. Enzymes.
5. Non - Protein Nitrogen.
6. Electrolytes.
7. Acid base & blood gas studies.
8. Drug monitoring including toxicology.

9. Endocrinology.
10. Vitamins, including provitamins and derivatives.
11. Haemo synthesis and degradation.
12. Body fluids other than blood serum and urine.
13. Instruments and technical specification.
14. Urine analysis.
15. Tests for glomerular filtration.
16. Tests of tubular function.
17. Tests for calculi.
18. Correlations with analytical results and disease states.
19. Quality Control.

The study areas outline should be considered as an expansion of knowledge following previous studies. Emphasis should be given to principles of laboratory practices.

Successful completion at the end of course examinations will enable students to study further concepts and the critical evaluation of different methodologies and their application to normal and diseased states.

The purpose and Scope of Clinical Investigations.

The essential objectives and limitations of clinical chemistry investigation in relation to clinical diagnosis and the treatment of disease. The physical and chemical characteristics of body fluids, secretions and excretions and the physiological and biochemical functions of the principal constituents of these materials and the way they alter in disease.

Analytical Procedures:

The collection, identification, preservation and preparation of samples for analysis. Laboratory safety. The value and limitations of qualitative and quantitative analysis. Factors influencing analytical procedures. Sample size and complexity and ultra micro procedures. Principles and application of common analytical techniques. Sources of error, reference ranges and quality controls.

MICROBIOLOGY.

Outline & Guidance.

Bacteriology.

1. General Microbiology.
2. Laboratory examination of specimens for bacteriology.
3. Procedures and techniques in diagnostic bacteriology.
4. Concepts of Infectious disease processes.
5. Clinically important bacterial agents.
6. Quality control.

Micro biology.

1. General Microbiology.
2. Laboratory examination of specimens for mycology.
3. Procedures and techniques in diagnostic mycology.
4. Clinically important fungal agents,
5. Quality control.

Parasitology.

1. General Parasitology.
2. Laboratory examination of specimens for parasites.
3. Specific procedures and techniques in parasitology.
4. Specific parasitic agents.
5. Quality control.

Virology.

1. General Virology.
2. Laboratory examination of specimens for viral agents.
3. Viral diseases/body site and agent.
4. Quality control.

Antimicrobiotic Agent Studies.

1. Properties of antimicrobial.
2. Laboratory tests.
3. Quality control.

Infection Control and Environmental Studies.

1. Epidemiology of infectious diseases.
2. Nosocomial infections.
3. Surveillance studies.
4. Handling and disposal of infectious materials.

Structure and Physiology of Micro - organisms.

The fine structure and function of the major structural components of the microbial cell. Comparison of bacterial protoplast spheroplasts, L - forms and mycoplasmas. Yeast and fungal cell walls and protoplasts. Structure and morphology of viruses. Critical comparison of growth and replication measurements, kinetics. Factors affecting and replication e.g. pH, temperature, oxygen. Microbial response to Environmental stress. Cell synchrony and its role in the study of cell Cycle.

Microbial Interactions.

Examples of mutualism, commensalisms, amensalism, predation and competition, interactions within microbial communities, i.e. gut flora, oral flora.

Microbial and virological Taxonomy and nomenclature.

The basis and development of microbial taxonomy and nomenclature. The application of charges in nomenclature. Working of the International committee of systematize.

Products of Microbial Metabolism.

Recognition, demonstration and composition of microbial toxins and products of metabolism. Principles and application of physical and chemical methods for the destructions of Micro - organisms.

Physical methods including thermal destruction, sanitation and irradiation. The chemistry and mode of action of antimicrobial compounds. The dynamics of disinfections, dilution coefficients. Principles employed in the Isolation and Identification of micro organism. The use of contemporary methods and the influence of automation and mechanization.

HEMATOLOGY.

Outline & Guidance

1. Origin, development and function of formal elements of blood.
2. Morphology and maturation.
3. Laboratory procedures - general.
4. Tests to characterize anemias.
5. Cytochemical stains.
6. Other tests to characterize leukocyte disorders.
7. Quality control.
8. Disorder / correlation.
9. Instrumentation.
10. Hemostasis.
11. Quality control.
12. Theory.
13. Screening tests.
14. Platelet function tests.
15. Factor identification.
16. Fibrinolysis.
17. Diseases / correlations.
18. Instrumentation.

Reticuloendothelial System and Blood.

Structure and function of blood cell forming tissue in the embryo, child and adult. Haemopoiesis, Haem and globin chain synthesis. Structure and function of the cellular and sub - cellular elements of the blood. Blood cell survival and destruction.

Anatomy and Microanatomy.

Morphology, structure and ultrastructure of blood cells and their precursors. Structure of cell membrance. Study of cell components and their Metabolism. Cell outline Light and electron microscopy. Autoradiography and microdensitometry.

Principles of Haematology Practice.

To include cell counting, immunological aspects kinetics, biological and radio assay system, electophoresis, chromatographic and spectrophotometric analysis, cytochemistry and theology.

HISTOPATHO LOGY / CELLULAR PATHOLOGY.

Outline & Guidance.

Human anatomy and histology. Normal cells and tissues: Structure and ultra structure, Physiological variation, immune response.

Methodology : General Principles.

Fixation and the use of fixatives. Preparatory techniques for dissociated cells and tissues. Embedding procedures, lysochromes and metallic salts. Vital staining with dyes. The use of stains and histochemical methods to demonstrate cells, tissues and their constituents. Methods of obtaining and handling biopsies, large surgical specimens and post mortem tissue. Special fixatives and their applications. Decalcification and the preparation of sections.

Freeze drying and freeze substitution. Cryopreservation. Artifacts Histochemistry of carbohydrates, lipids amyloids, nucleic acids, enzymes, biogenetic animes and inorganic constituents.

The application of stains and histochemical methods to diagnostic problems and the significance of he results obtained. Co-oparative evaluation of methods.

Organization and management of the laboratory. Safety procedures, quality assurance. Relevant legal and entical requirements Use and maintenance of microtome and other associated instruments.

IMMUNOLOGY

Outline & Guidance

1. Cellular and humoral immunity.
2. Immunoglobulins: Complements.
3. Basic immunological methods.
4. Syphilis and infectious mononucleosis serologies.
5. Other infections serologies, CRP Cold agglutinins.
6. Auto immunes serologies.
7. Testing for fungi and parasites,
8. Pregnancy testing.
9. Testing Involving leukocytes.

Immunoglobulin: Structure. Chemistry, Synthesis, Clarification and Function.

Detection of Antigen and Antibodies: Structure of antigens and antibodies. Their separation, isolation and quantitation. Antigen antibody reaction. Identification of substances of immunological importance including the role of complement.

Fundamental Concepts of Adoptive Immunity.

The concept of self and non self The nature and fate of antigens Examination of colonial distribution and the generation of diversity. The basis of immunological memory and tolerance.