CMJ UNIVERSITY, SHILLONG

REGULATION FOR B.Sc.(MEDICAL LABORATORY TECHNOLOGY)

Duration – Three Years

Eligibility - 10+2 with Biology

Scheme of Distribution of Marks

Sr. No.	First Year	Internal Assessment Marks	Term End Examination	Total Marks	Passing Marks
1	Introduction To Medical Lab Technology	30	70	100	40
2	Anatomy	30	70	100	40
3	Physiology	30	70	100	40
4	Microbiology	30	70	100	40
5	Practical - I				
Sr. No.	**Second Year**	**Internal Assessment Marks**	**Term End Examination**	**Total Marks**	**Passing Marks**
1	Heamatology	30	70	100	40
2	Immunology	30	70	100	40
3	Biochemistry	30	70	100	40
4	Biostatistics And Computer applications	30	70	100	40
5	Practical - II				
Sr. No.	**Third Year**	**Internal Assessment Marks**	**Term End Examination**	**Total Marks**	**Passing Marks**
1	Pathology	30	70	100	40
2	Microbiology – II	30	70	100	40
3	Biochemistry – II	30	70	100	40
4	Physiology – II	30	70	100	40
5	Project And Viva				

B.Sc (MEDICAL LAB TECHNOLOGY)-FIRST YEAR SYLLABUS

INTRODUCTION TO MEDICAL LAB TECHNOLOGY

UNIT-I

Human Health and Medical Care in Developing Countries:Human health and homeostasis-Medical care in India - Medical Laboratories of developing countries Organization of the Clinical Laboratory and Role of Medical Laboratory Technicians :Functional components of clinical laboratories - Communication between physician and clinical laboratory - The medical laboratory professional - Basic needs of a clinical laboratory.

UNIT-II

Safety Regulations, First Aid and Clinical Laboratory Records:Basic causes of accidents-Common types of laboratory accidents - First Aid in laboratory accidents - Clinical laboratory records - Annexes of laboratory records

UNIT-III

Introduction to Laboratory Equipment and Basic Laboratory Operations:Identification and use of common laboratory glassware and equipment - Techniques of simple laboratory operation - Laboratory reagents

UNIT-IV

Use and care of common laboratory instruments -General Comments on Specimen Collection: General consideration - Blood - Urine -Sputum - Throat swab - Stool - Cerebrospinal fluid - Miscellaneous specimens

UNIT-V

Units of Measurement, Preparation of Regent Solutions and Laboratory Calculations:The metric system - Reagent solutions - Preparation of reagent solutions - Laboratory calculations Quality Control of Laboratory Findings: General approach to quality control - Quality control of quantitative data.

ANATOMY

UNIT-I

History of anatomy-the cell-the tissues-epithelial tissue-connective tissue-muscular tissue-nervous tissue-membranes-glands

UNIT-II

Organs of the body-systems of the body-body fluids-skeletal system-Development and growth of bones-bones of the skull-bones of the face-bones of upper limb-bones of wrist and hand-bones of thorax-bones of the pelvic girdle-bones of lower limb-bones of foot

UNIT-III

Joints of the skeleton-joints of upper limb-joints of lower limb-joints disorders-blood Disorders of blood-disorders of clotting-lymphatic system-reticulo-endothelial system.

UNIT-IV

Cardiovascular system-the veins-cardiovascular disorders-disorders of blood vessels-disorders of blood pressure-respiratory system

UNIT-V

Urinary System-formation of urine-diseases of the urinary system -the muscular system-muscles of shoulder girdle-muscles of upper limb-muscles of thorax -muscles of abdomen-muscles of the back -muscles of perineum -muscles of thigh -diseases of muscles

PHYSIOLOGY

UNIT I

Blood – Function, composition, coagulation, factors affecting coagulation; Development and functions of RBC, WBC and platelets; Haemoglobin – functions and synthesis; Blood groups

UNIT II

Cardiovascular system – Structure of heart, special junctional tissues of heart, origin and conduction of heart beat, cardiac cycle, cardiac output; Blood pressure – Measurement and factors affecting blood pressure.

UNIT III

Respiratory system – Definition, process of respiration, structure & functions of respiratory tract, mechanism of breathing, lung volumes, lung capacities, oxygen and CO_2 transport; Definitions of diffusion, perfusion, anoxia, dysbarism, asphyxia, hyperpnoea, orthopnoea and cyanosis;

Special senses – Taste – primary taste sensations, histology of tastebuds, factor influencing taste sensations; Smell – Classification of odour, physiology of olfaction.

UNIT IV

Digestive system – Structure and functions of digestive system; digestive juices – composition and function, digestion and absorption of foodstuffs – carbohydrate, protein and lipids; Urinary system – structure and functions of kidney, formation of urine, factors affecting formation of urine, micturition, nocturia, oliguria and anuria.

UNIT V

Reproductive system – Structure and functions of male and female reproductive system, menstrual cycle; Endocrine system – Functions of hormones secreted by pituitary, thyroid, parathyroid, adrenal and reproductive glands.

MICROBIOLOGY

UNIT-I

Origin and evolution of Microbiology - Contribution of Early Microbiologists-Classification of Microorganisms - Hackel three kingdom concepts - Whittaker's five kingdom concepts-Classification and salient features of bacteria according to the Bergey's manual of determinative bacteriology- Cyanobacteria

UNIT-II

Microscopy - Simple-Compound, Dark-field, Phase contrast, Fluorescent and Electron microscopes-SEM,TEM, Freeze fraction confocal microscopy and their applications - Stains and Staining reactions- Simple, Differential and special attaining techniques.

Unit-III

Bacterial Anatomy - Structure-properties and biosynthesis of cellular components of bacteria. Culture media and Culture methods-Aerobic and Anaerobic- Preservation method, sporulation and its mechanism.

Unit-IV

Bacterial physiology - Growth-factors- nutritional requirements for bacterial growth. Bacterial metabolism -Respiration- Fermentation-Photosynthesis.

Unit-V

Microbial pathogenicity - Toxins-Characterization –mode of action-Antimicrobial chemotherapy –Antibiotics - Classification – Mode of action-drug resistance-Sensitivity tests - Sterilization and disinfection – methods and quality control.

BML – 105- Practical – I

B.Sc MEDICAL LAB TECHNOLOGY – SECOND YEAR SYLLABUS

HEAMATOLOGY

UNIT-I

Introduction to Haematology: Components of blood and their functions – Haematopoietic system of the body

Specimen Collection and Laboratory Preparation in Haematology: Specimen collection for haematological studies- Cleaning of laboratory glassware in haematology

Routine Haematological Tests: Determination of haemoglobin concentration- Determination of haematocrit- Enumeration of formed elements – Calculation of red blood cell indices- MCV, MCH and MCH- Automated systems in haematology – Study of blood smear for differential count and cell morphology- Abnormal cells in peripheral blood smear – Reticulocyte count- Erythrocyte sedimentation rate (ESR)- Eosinophil count Platelet count.

UNIT-II

Special Haematological Tests: Screening for sick cells anaemia – Estimation of foetal haemoglobin – Haemoglobin electrophoresis- Osmotic fragility test- Heinz body preparation- Laboratory diagnosis of protozoan blood parasites- Lupus erythematosus (LE) cell preparation – Preparation of bon marrow smear for microscopic examination – Cytochemical tests

Interpretation of Laboratory Findings in Haematology: Anaemias- Leukaemias- Miscellaneous disorders

Unit-III

Introduction to Haemostasis and Coagulation: Haemostasis – Mechanism of blood coagulation- Fibrinolysis

Laboratory Investigation of Bleeding Disorders

Bleeding time determination- Whole blood clotting time – Clot retraction and lysis time- Laboratory preparation for coagulation tests- Routine coagulation tests (prothrombin time plasma recalcification time, partial thromoboplastin time – activated partial thromboplastin time and thrombin time).- Laboratory diagnosis of bleeding disorders

UNIT-IV

Principles of Immunohaematology and Clinical Significance of Blood Transfusion

Principles of immunohaematolgoy – Human blood group systems – (basic ABO blood group system- Rhesus blood group system and immune antibodies- D^u -other blood group systems –Clinical significance of blood transfusion

Collection and processing of Blood for Transfusion : Preparation for blood collection- Blood collection- Transportation of blood after collection – Stoage of blood – Preparation and use of blood components

UNIT-V

Routine Laboratory Procedures in Blood Bank : Specimen collection for blood bank- General laboratory preparations in blood bank- Preparation of laboratory reagents in blood bank- Reporting of haemagglutinations reaction blood grouping – Rh blood typing – Antihuman globulin or Coombs test – Compantibility testing or crossmatching – Review question – Annexure :Request for blood transfusion

Transfusion reactions and haemolytic disease of the newborn : Blood transfusion process- Transfussion reaction – Haemolytic disease of the newborn

IMMUNOLOGY

UNIT-I

Historical perspectives -Overview of immune system-Innate and acquired immunity. -Immune system structure and organization.

UNIT – II

Antigen and antigenicity-Immunoglobulins – Structure and function-Complements-Antigen – Antibody interaction-Monoclonal antibodies.

UNIT – III

Organization and expressions of immunoglobulin genes-Histocompatability complex.

UNIT – IV

Cytokines: Types and function-Cytokine receptors Biological functions of cytokines-Cell mediated immunity– receptors -T cell activation-Humoral response-B cell activation and proliferation-Hypersensitive reactions.

UNIT – V

Immune regulation-Autoimmunity-Vaccines and immune response to infectious diseases-Immune deficiency diseases (AIDS)-Immune suppression -Transplantation.

BIOCHEMISTRY

UNIT – I

Carbohydrates : - Monosaccharides and Disaccharides – Definition, classification, structure, properties and biological significance, Polysaccharides – Types and biological importance.

UNIT – II

Amino acids – classification, essential and Non-essential amino acid, structure and properties. Proteins – Definition, classification and function. Structure levels of organization. Denaturation and Renaturation.

UNIT – III

Enzymes : Definitions, classification with example, Active site, Lock and key model, Induced fit hypothesis. Enzyme units. Kinetics factors affecting enzyme activity, M.M. equation, LB. Plot, Enzyme inhibition.

UNIT – IV

Lipids : Classification of lipids, physical and chemical properties, saturated, unsaturated fatty acids and steroids. Structure of cell membrane and Transport. **Vitamins :** Classification, occurrence, deficiency symptoms, biochemicals functions of fat soluble and water soluble vitamins.

UNIT – V

Buffers – Definition, important buffers in blood (Bicarbonate, phosphate and hemoglobin buffer systems), Bioenergetics : Laws of thermodynamics, Hormones : - Definition, classification of hormones, Biological functions and disorders of pancreatic hormone (Insulin), thyroid hormone (thyroxin),

BIOSTATISTICS AND COMPUTER APPLICATIONS

UNIT – I

CLASSIFICATION AND PRESENTATION OF DATA: Definition – Statistics and its application in Biology – Collection of data. Classification: Qualitative and Quantitative.

Tabulation : Diagrammatic representation – Graphical representation – frequency curves – frequency polygon and ogive curve – Population statistics.

UNIT – II

DESCRIPTIVE AND INFERNTIAL STATISTICS: Measures of Central tendency: Arithmetic mean – Median – mode.

Measures of dispersion : Standard deviations and standard errors – co-efficient of variance.

Probability distribution – Binomial and Poisson distribution – Student 't' Test –estimation and hypothesis. Test of significance – small samples and large samples – X^2 distribution and its uses.

UNIT –III

CORRELATION AND REGRESSION

Correlation: Correlation of Karl Pearson's Co-efficient of correlation – testing its significance – interpretation.

Regression Analysis: Regression Coefficient – Construction of regression lines – properties – application.

UNIT – IV

BASIC CONCEPT OF COMPUTERS

Introduction to computers – characteristics of computers – Classification of digital computer systems – Anatomy of a digital computer – Number system (Basic Concept only) – memory units – Input and output devices – Auxiliary storage devices.

UNIT-V

COMPUTER APPLICATIONS:

Computer Software: Programming languages (BASIC, COBOL, FORTRAN AND C – only basic concept) – Operating Systems. Windows (WORD – EXCEL AND OWERPOINT – BASIC concept only). Data processing and Database Management – Internet – Email – Computer applications in Science and Technology

BML – 205 -Practical - II

BACHELOR OF SCIENCE [MEDICAL LAB TECHNOLOGY]

THIRD YEAR SYLLABUS

PATHOLOGY

Unit – I

Cell Pathology – Cell Injury, Apoptosis, Inflammation and Repair – Chronic Inflammation, Regeneration and Repair, Bleeding and Clotting – Hemostasis and Thrombosis, Disseminated Intravascular Coagulation (DIC), Immunopathology – Organ Transplant, Systemic Iupus erythemotosus (SLE), Immuno Deficiency, HIV (AIDS)

Unit - II

Neoplasia – Molecular Basis of Cancer, Developmental and Genetic Diseases – Chromosomal Abnormalities, Infectious Diseases – Bacterial Infections, Sexually Transmitted Bacterial Diseases, Systematic Pathology, The Heart – Heart Failure, Ischaemic Heart Disease (IHD), Rheumatic Fever, Endocarditis,

Unit - III

Heamopoietic and Lymphoid System – Anaemia, Respiratory System – Pulmonary Embolism, Bronchogenic Carcinoma, Diseases of Pleura, Gastrointestinal System – Esophagus, Stomach, Hepatobiliary System – Bilirubin, Viral Hepatitis, Immunologically Mediated Hepatitis, Alcoholic Liver Disease (ALD), Liver Tumors, Diabetes Mellitus -

Unit – IV

Urinary System – Glomerular Diseases, SLE and Kidneys, Pyleonephritis, Renal Tumors, Genital System – Male Genital System, Female Genital System, Ovarian Tumors, Female Breast – Breast Cancer, Endocrine System – Pituitary, Thyroid, Adrenals

Unit – V

Central Nervous System – Cerebral Infections, Cellular Inclusions in Viral Infections, Neurodegenerative Diseases, Nutritional, Metabolic and Toxic Brain Diseases, Cerebral Neoplasms, Peripheral Nerves, Skeletal Muscles – Muscular Dystrophies, Bones and Joints – Bone Diseases, Joint Diseases, The Skin – Skin and Hypersensitivity, Skin Neoplasms

MICROBIOLOGY – II

UNIT – I

Immunology/Serology

Basics of Immunology - Antigen-Antibody Reactions, Hypersensitivity Reactions, Introduction to Serology and Sero-diagnostic Procedures, Principles of Serodiagnostic Tests, Modern Immunologic Techniques, Laboratory Procedures in Serology

UNIT – II

Systematic Bacteriology

Neisseria and Branhamella, Corynebacterium Diphtheriae, Clostridium Tetani, Mycobacterium Tuberculosis, Mycobaterium Leprae, Spirochaetes, Mycoplasma, Actinomycetes, Chlamydiae

UNIT – III

Virology

Viruses: General Properties and Classification, Cultivation of Viruses, Diagnostic Virology, Influenza and Respiratory Viruses, Vrial Gastroenteritis, Viral Hepatitis, Retroviruses, Rabies, Non-arthropod Borne Haemorrhagic, Fevers, Arenavirus Infection, Antiviral Therapy

UNIT – IV

Parasitology

Intestinal Protozoa, Blood and Tissue Pathogens, Multicellular Parasites, Trematodes, Nematodes, Laboratory Procedures in Parasitology

UNIT – V

Mycology

Introduction, Classification and General Properties of Fungus, Laboratory Diagnosis of Fungal Infections, Laboratory Culture of Fungi, Diagnostic Mycology, Rhizopus, Absidia and Mucor, Antifungal Chemotherapy, Mycotoxicosis

BIOCHEMISTRY – II

UNIT – I

Chemistry of Carbohydrates – Classification of Carbohydrates – Monosaccharides, Oligosaccharides, Polysaccharides, Chemistry of Lipids – Simple Lipids, Compound Lipids, Derived Lipid, Chemistry of Amino acids, and Proteins, Hemoglobin

UNIT – II

Metabolism of Carbohydrates – Glycolysis, Citric Acid Cycle, Energetics, Glycogenesis, Gluconeogenesis, Galactose Metabolism, Fructose Metabolism, Lactose Synthesis, Regulation of Blood Glucose, Metabolism of Lipids – Plasma Lipoproteins

UNIT – III

Biophysics – Hydrogen Ion Concentration pH, Osmosis and Osmotic Pressure, Biological Oxidation – Mixed Function Oxidases, High Energy Compounds, Respiratory Chain, Nucleic Acid – Chemistry and Metabolism, Acid Base Balance

UNIT – IV

Water and Mineral Metabolism – Biological Importance of Water, Minerals, Xenobiotics, Nutrition, Food Values, Organ Function Tests – Liver Function Tests, Renal Function Tests, Pancreatic Function Test, GIT Function Test

UNIT – V

Immunology – Functions of T Cells, Cancer, Protein Biosynthesis, Activation Step, Initiation of Polypeptide Chain (In Ribosomes), Elongation, Termination, Codon, Regulation of Gene Expression, Instrumentation – Colorimetry, Electrophoresis, Isotopes and Their Application, Chromatography

PHYSIOLOGY – II

UNIT - I

Cellular Physiology – transfer of Elements across the Cell Membrane, Neuron – Morphology, Classification of Nerves, Generation of Nerve-Action Potential, Physiological Properties of Nerve Fiber, Nerve Metabolism

UNIT - II

Muscle – Morphology, Types of Fibers in Muscle, Properties of Muscle, Alimentary System – The Digestive Secretion, Movement of Small Sense, Absorption in Small Intestine, Secretions in the Large Intestine, Mechanism of Secretion of Juices, Digestion of Carbohydrates, Proteins, Fats, Nutrition,

UNIT - III

Excretory System – Morphology, Blood Circulation in Kidney, Mechanism of Formation of Urine, Functions of Kidney, Renal Function Test, Dialysis, Micturition,

UNIT - IV

Endocrines - Hypothalamus, Pituitary Gland or Hypophysis Cerenbri, Thyroid Gland, Parathyroid Gland, Islets of Langerhans (Pancreas), Adrenal Gland, Gonadal Hormones,

UNIT - V

Nervous System – The Spinal Cord or Medulla Spinals, Spinal Injury or Lesion, The Brainstem, Reticular Formation and Reticular Activating System, Cerebellum, Thalamus, Hypothalamus, The Limbic System, The Cerebral Cortex, Autonomic Nervous System

BML 305 – PROJECT AND VIVA