

# **B.S.C CURRICULUM UNITS**

## **YEAR I**

### **FIRST SEMESTER**

#### **3.1 INTRODUCTION TO MEDICAL LABORATORY SCIENCES**

##### **& HEALTH ETHICS AND LAW**

###### **Course Content**

1. Definition
2. Departments of medical laboratory
3. Staff of medical laboratory
4. Relationship with other health team.
5. Medical laboratory accreditation
6. Potential job opportunities and career developments.
7. Healthcare system in Kenya - hierarchy of healthcare facilities. Registration, licensing, discipline and welfare of: medical doctors & dentists, nurses, clinical officers, medical laboratory technologists and technicians, Veterinary surgeons and paraprofessionals, Pharmacists and Pharmaceutical Technologists, Psychiatrists, private practice, continuing education. Professional associations and regulatory bodies, freedom to choose.

#### **3.2 BIOSAFETY AND BIOSECURITY**

1. Introduction to Biosafety. Principles of Laboratory Biosafety.
2. Laboratory Biosafety Protocols.
3. Containment Levels
4. Biological Safety Cabinets.
5. Accidents in the Laboratory / Reporting of Accidents.
6. Sterilization and Disinfection in the Laboratory.
7. Risk assessment in Biosafety.
8. Safe Handling of Laboratory Equipment and Materials.
9. Personal Protective equipment (PPE).
10. Waste Disposal.
11. Introduction to Biosecurity.
12. Laboratory Biosafety Vs Laboratory Biosecurity.
13. Principles of Laboratory Biosecurity.
14. Components of a biosecurity programme
15. Personnel management, Information security, Management of Biosecurity activities.
16. Issues of bioterrorism.

### **3.3 HUMAN ANATOMY I**

1. Introduction to human anatomy
2. Divisions of human anatomy.
3. The cell. Basic tissues and histology.
4. Superficial anatomy
5. Internal organs by region
6. Embryology

### **3.4 BASIC MATHEMATICS**

1. Quadratic functions and equations, surds, logarithms and indices.
2. Permutations and combinations.
3. Series
4. Remainder theorem and its application to solution of factorisable polynomial equations.
5. Trigonometry
6. Sine and cosine formulae.
7. Statistics
8. Probability

### **3.5 PHYSICS FOR MEDICAL SCIENCES**

1. Units and measurements
2. Linear and circular motion
3. Waves
4. Electromagnetic spectrum and uses
5. Electric charges

### **3.6 EXPERIMENTAL ANIMAL SCIENCE**

1. Laboratory animals
2. Physical facilities
3. Animal models/computer simulation.
4. Legislation and ethics
5. Animal hazards

## **YEAR I**

### **SECOND SEMESTER**

### **3.7 ORGANIC CHEMISTRY**

1. Introduction to organic chemistry
2. Lewis structures, molecular shapes
3. Acids and bases
4. Introduction to organic functional groups
5. Alkanes
6. Stereochemistry
7. Introduction to organic reactions
8. Introduction to spectroscopic

9. Alkyl halides
10. Elimination reactions
11. The chemistry
12. Preparation and reactions of alkenes; preparation and chemistry of alkynes.

### **3.8 BIOCHEMISTRY I**

1. Biomolecules and cells
2. Proteins and their biological functions
3. Amino Acids building blocks of proteins
4. Proteins purification and characterization
5. Enzymes and their classification
6. Carbohydrates
7. Reactions of Monosaccharide
8. Vitamins and coenzymes
9. Nucleic acid biochemistry

### **3.9 INTRODUCTION TO MICROBIOLOGY**

1. Introduction
2. Laboratory safety
3. Specimen collection and processing
4. Culture of microorganisms
5. Staining
6. Identification of bacteria.
7. Culture Media
8. Host-parasite relationships
9. Routes of transmission of infectious agents

### **3.10 HUMAN ANATOMY II**

1. Major organ systems

### **3.11 INORGANIC CHEMISTRY**

1. Basic chemical concepts and mechanisms.
2. Physical chemistry.
3. Analytical chemistry.
4. Periodic table
5. Bonding
6. Inorganic reactions
7. Reduction and oxidation.

### **3.12 HUMAN PHYSIOLOGY I**

1. Introduction to human physiology.
2. The cell
3. The concept of homeostasis.
4. Blood
5. Body fluids

## **YEAR II**

### **FIRST SEMESTER**

#### **3.13 HUMAN PHYSIOLOGY II**

1. Endocrine system
2. Hormone secretion and its control.
3. Hormone functions.
4. Nervous system
5. Other functions of the brain.
6. Electroencephalography, Evoked potentials.
7. Cardiovascular system
8. Investigative procedures
9. The lymphatic system.
10. Respiratory system
11. Investigative procedures
12. The immature kidney.
13. Investigative procedures
14. Reproductive system
15. Pregnancy, Parturition, Lactation and Breast-feeding.
16. Digestive system
17. Musculo-skeletal system.
18. The physiology of locomotion.
19. Blood forming organs

#### **3.14 IMMUNOLOGY I**

1. Introduction to immune system
2. Functional organization of the immune system
3. Immune Response
4. Antigens and immunogens
5. Antibody
6. Antigen - Antibody interactions
7. Major Histocompatibility Complexes (MHC
8. Effector mechanisms of the immune responses
9. Immunity to infections
10. Immunodeficiency
11. Tumour immunology

### **3.15 MEDICAL BIOTECHNOLOGY**

1. Biotechnology
2. Recombinant DNA Technology
3. Cell culture
4. Organ culture
5. Monoclonal antibodies
6. Recombinant subunit vaccines
7. Development of new biotechnology medicines

### **3.16 BIOCHEMISTRY II**

1. Carbohydrates metabolism
2. Lipid metabolism
3. Amino acids metabolism
4. Biochemical Aspects of hormone Action

### **3.17 CLINICAL PHARMACOLOGY**

1. Clinical uses of drugs
2. Adverse effects; classification, management and prevention.
3. Analysis in clinical pharmacology
4. Drug abuse and compliance.
5. Substance and alcohol abuse.

### **3.18 CLINICAL HAEMATOLOGY I**

1. Introduction to haematology.
2. Structure of the bone marrow.
3. Blood cell formation
4. Composition of blood.
5. Anaemia
6. Leukemia

## **YEAR II**

### **SECOND SEMESTER**

### **3.19 BIostatISTICS**

1. Introduction to biostatistics
2. Descriptive statistics
3. Normal distribution
4. Hypothesis testing/significance tests
5. Sampling and sample size determination

### **3.20 CELL BIOLOGY AND CYTOLOGY**

1. Cell Structure and Organelles
2. Mechanisms of cellular communication
3. Cellular reproduction
4. Protein synthesis
5. Red blood cells
6. Extracellular fluids

### **3.21 IMMUNOLOGY II**

1. Immunology in medicine
2. Immunotechniques
3. Monoclonal antibodies
4. Vaccines & Vaccination
5. Abnormal immune responses
6. Transplantation
7. Tumor immunology
8. Gene therapy.
9. Immunomodulators

### **3.22 MOLECULAR BIOLOGY AND GENETICS**

1. Cell
2. Perspectives of biological macromolecules
3. Molecular basis of life
4. Mutations
5. Genes expression
6. Control of gene expression
7. Manipulations of DNA
8. Introduction to Functional Proteomics
9. Practical

### **3.23 MEDICAL ENTOMOLOGY AND VECTOR BIOLOGY**

1. Classification, morphology of hemaphagous arthropod vectors
2. Introduction to arthropod biology
3. Vector-Parasite interactions
4. Entomological techniques
5. Management and control of vectors and parasites of human diseases

### **3.24 CLINICAL HAEMATOLOGY II**

1. Specimen
2. Quality control programmes in haematology
3. Automation in haematology.
4. Total blood cell count

## **YEAR III**

### **FIRST SEMESTER**

#### **3.25 HISTOTECHNOLOGY, CYTOTECHNOLOGY AND MUSEUM TECHNIQUES**

1. Histotechnology and Cytotechnology
2. Microscopy
3. Tissue processing
4. Fixatives
5. Microtomy
6. Stains
7. Decalcification
8. Immunohistochemistry
9. Photography
10. Archiving
11. Quality assurance in histology
12. Cytology
13. Screening program
14. Staining in cytology
15. Quality assurance in cytology
16. Interpretation
17. Museum and mortuary techniques
18. Museum
19. Storage and cataloguing: Mortuary techniques
20. Disposal of bodies
21. Exhumation
22. Embalming
23. Repatriation of bodies

#### **3.26 FIRST AID**

1. First aid and emergency care preparations
2. Blood borne pathogens and universal precautions; Management of different types of emergencies
3. Triage

#### **3.27 BLOOD TRANSFUSION I**

1. Genetic of blood group
2. Basic reagents in blood transfusion
3. Investigation of haemolytic disease of the newborn
4. Investigation of blood transfusion reaction
5. Collection of blood samples
6. Safety precautions in blood transfusion.

#### **3.28 FOOD AND WATER MICROBIOLOGY**

1. Milk analysis

2. Water analysis
3. Food analysis
4. Enumeration of bacteria in food

### **3.29 RESEARCH METHODOLOGY**

1. Introduction to research
2. Research proposal development
3. Intellectual property; Scientific communication and publishing
4. Funding

### **3.30 RESEARCH PROJECT**

1. Research proposal

## **YEAR III**

### **SECOND SEMESTER**

#### **3.31 MEDICAL VIROLOGY I**

1. Virus definition and structure
2. Classification
3. Pathogenesis
4. Host defences
5. Antiviral drugs
6. Viral vaccines.
7. Laboratory diagnosis

#### **3.32 CLINICAL CHEMISTRY I**

1. Introduction to clinical chemistry
2. General laboratory techniques and procedures
3. Chromatography
4. Isotopes in clinical chemistry
5. Electrophoresis
6. Electrochemical Techniques
7. Immunochemical Reactions Techniques
8. Analytical Equipments
9. Automation
10. Specimens collection, handling and processing
11. Quality Assurance
12. Microprocessor and computers in clinical chemistry laboratory:
13. Acquisition, management and application of laboratory data
14. Microprocessor's and computers in clinical chemistry laboratory:
15. Statistical analysis in clinical chemistry



### **3.33 MEDICAL PROTOZOLOGY**

1. Introduction to Parasitology.
2. Classification of parasites of medical importance.
3. Introduction to medical protozoology
4. Specimen collection, preservation, transport and processing
5. Laboratory diagnosis; Treatment and prophylaxis

### **3.34 MEDICAL HELMINTHOLOGY**

1. Introduction to medical helminthology
2. Cestodes
3. Trematodes
4. Nematodes

### **3.35 BLOOD TRANSFUSION II**

1. Organization of blood transfusion service
2. Preparation of blood products/components
3. Blood screening for transmissible diseases
4. Human leucocyte antigens
5. Transplantation
6. Haemovigilance
7. Automations in blood transfusion
8. Validation of equipment
9. Quality management systems in blood transfusion.

### **3.36 CLINICAL LABORATORY ROTATIONS**

1. Clinical communication skills
2. Patient-clinician interaction;
3. Clinician-clinician interaction
4. Basic patient care skills;
5. Collection of specimens for laboratory analysis;
6. Venepuncture and collection of blood specimens.

### **3.37 BMLS 312 COMMUNITY-BASED LABORATORY PRACTICE**

1. Community health structure;
2. Organization of health services in the community
3. Organization and types of laboratory services in the community
4. Introduction to family health.

### **3.38 CLINICAL/HOSPITAL ATTACHMENT**

1. Haematology
2. Clinical Chemistry
3. Blood transfusion
4. Bacteriology
5. Parasitology

6. Histology
7. Immunology/Virology
8. Mycology.

## **YEAR IV**

### **FIRST SEMESTER**

#### **3.39 CLINICAL CHEMISTRY II**

1. Carbohydrate Metabolism
2. Hyperglycaemic disorders
3. Hypoglycemia
4. Glucose Test Profiles
5. Glucose Laboratory Analysis
6. Ketones
7. Lipids Metabolism
8. Disorders
9. lipid profile analysis
10. Cardiac Function
11. cardiovascular disease risk factors
12. cardiac test profile
13. Renal Function
14. Enzymes and enzymatic reactions
15. Endocrinology
16. Body Fluids Balance
17. Metabolic disorders of amino acids, vitamins and various minerals in body fluids and their analysis

#### **3.40 MEDICAL BACTERIOLOGY I**

1. Bacteria structure
2. Classification of medically important Bacteria
3. Pathogenesis
4. Laboratory Diagnosis
5. Antimicrobial drugs
6. Principles of bacterial vaccines
7. Sterilization and disinfection in laboratory practice
8. Internal Quality Control and External Quality Assurance.

#### **3.41 MEDICAL VIROLOGY II**

1. DNA enveloped viruses
2. DNA Non-envelop virus
3. RNA enveloped viruses
4. RNA Non-enveloped virus
5. Tumor viruses. Slow viruses and prions.

6. HIV. Laboratory Methods

**3.42 MEDICAL MYCOLOGY**

1. Nomenclature, taxonomy, and identification techniques
2. Clinical grouping of mycoses

**3.43 MEDICAL DIAGNOSTIC IMAGING**

1. Definition of medical imaging.
2. Imaging modalities and imaging equipments
3. Non-ionizing radiation imaging
4. Radiation application regulations and QA

**3.44 GENERAL AND SYSTEMIC PATHOLOGY**

1. Introduction to pathology.
2. Pathology of the cell
3. Inflammation
4. Healing and repair
5. Disease caused by chemical and physical agents
6. Neoplasia
7. Haemodynamic disorders
8. Shock
9. Environmental and Nutritional pathology
10. Genetic disorders
11. Investigations of systemic diseases

**YEAR IV**

**SECOND SEMESTER**

**3.45 MEDICAL BACTERIOLOGY II**

1. Major pathogens in clinical bacteriology
2. Gram positive and Negative organisms.
3. New diagnostic tools and techniques
4. Automated bacterial identification systems
5. Molecular techniques in identification of mycobacteria and Gram Negative Bacteria.

**3.46 NUTRITION AND DIETETICS**

1. Introduction
2. Nutrition in the life cycle
3. Nutrient deficiency disorders
4. Nutrition and diseases
5. Assessment of nutritional status
6. Biochemical/laboratory nutrition assessment methods

## 7. Practical session

### **3.47 COMMUNITY HEALTH**

1. The concepts of community
2. Concepts of disease and health
3. Community structure and organization.
4. Principles and practice of community and family health care.
5. Epidemiology.
6. Distribution and determinants of health and disease in communities.
7. Use and misuse of statistics.
8. Definition and principles of demography.
9. Health care delivery system
10. Role of Health Care
11. Primary Health Care
12. Associated factors: socio-economic, socio-cultural, political and environmental.
13. Impact of health reforms
14. Complementary medicine in community health.
15. Community diagnosis
16. Health centre laboratory organization and management.
17. Laboratory specimen
18. Disaster and epidemic preparedness.

### **3.48 LABORATORY MANAGEMENT**

1. Organization of the health sector
2. Management
3. Current trends in laboratory services
4. Health economics
5. Supplies.
6. Human Resources

### **3.49 NUCLEAR MEDICINE**

1. Introduction to nuclear medicine
2. Radioisotopes and tracers
3. Radioactivity
4. Radiobiology.
5. Radionuclide imaging/therapy
6. Radiation and particle hazards
7. Radionuclide medical applications
8. Tracers in medical research