Identified Competency Focus Areas and Core Courses for Ethiopian Higher Education Institutions' Exit Examination

(Revised)

Program: Bachelor of Sciences in Medical Laboratory

BSc in Medical Laboratory Sciences

BSc in Medical Laboratory Technology

Prepared By:

1. Mistire Wolde , AAU
2. Kiyar Jemal, AMU
3. Dejene Gebre, JU
4. Tadesse Shume, HU

December, 2022

Addis Ababa, Ethiopia

CONTENT

1. INTRODUCTION

Education is a mainstay for development and alleviation of rampant problems of a given nation. It can offer opportunities to the citizens of a country to play a pivotal role in bringing and sustaining the required development in various sectors in which the health delivery system is not an exception. The laboratory service as an essential component of the health care delivery system requires properly trained professionals.

The clinical laboratory work force comprises a critical sector of the health care workforce. Due to advances in medical technology, clinical laboratory workers perform an ever-increasing range of tests help in detecting and diagnosing diseases or pre disease states as well as monitoring the progress and results of treatment among other things.

Formal laboratory professionals training in Ethiopia was started in 1954. Since then, numerous laboratory professionals were trained at different levels and assumed positions in various health institutions and contributed significantly to the health care delivery system of the country which enabled selected laboratory technology diploma graduates to pursue their first degree.

Currently, health institutions (hospitals, health centers, regional laboratories, and others), higher education institutions (government and private), research institutions and industries that require competent medical laboratory professionals at different level of training and expertise are progressively growing. As a consequence, ample opportunities are created for medical laboratory science practitioners to play a vital role in the country's development. However, the input of these professionals to a great extent depends on the quality of education (training) they receive in the higher learning institutions.

Therefore, to assure the quality of education at HEIs, there should be a strategy to evaluate whether graduates have attained the required competencies, in terms of knowledge, skill, and attitude. In this regard, administration of national exit exams is one of the appropriate strategies commonly applied in different countries worldwide.

Accordingly, Ministry of Education (MoE) conducted different levels of workshops with respective stakeholders, including MoH, to develop comprehensive National Exit Exam for Medical Laboratory Science undergraduate program.

1.1. Objectives of national Exit Examination

The nationally administered exit exam has the following objectives:

- To produce skilled and competent Medical laboratory professionals to national and international market
- Improving public trust and confidence in medical laboratory profession
- Facilitating the efforts of students to revise the core learning outcomes of the courses covered by the exit examination
- Ensuring all graduates from HEIs satisfy the requirements of the labor market and employability
- To ensure students' achievement and improve the quality of education
- To improve the relevance of academic programs and institutional performance;
- To assess whether higher education graduates attain the graduate profile or not
- To provide a platform as a quality monitoring tool in the form of certification of competence for employment

1.2. Significance of the Document

It is important to set competency areas of the subject matter (program) in order to measure to what extent; the graduates are acquired with skills, knowledge and attitudes. The following are the significance of setting competencies and identifying core courses of the program;

- To set competencies that help to assess the basic skills, knowledge and attitude of graduating students;
- To systematically identify the core courses that will be included in the exit exam
- To realize standardization of higher education programs and to be able to meet minimum quality standards across all programs

2. EXPECTED GRADUATE PROFILE

A student who has successfully completed the B.Sc. in Medical Laboratory Sciences education will be able to:

- Understand management, policies, principles and procedures of the medical laboratory sciences
- Recognize and interpret laboratory findings and correlate with common disease pathogenesis
- Recognize ways of surveillance of communicable diseases
- Confirm and verify results through an in-depth knowledge of scientific methods, principles and instrumentation theory.
- Recognize laboratory logistic procurement, evaluation, setup specification and equipment auditing

- Understand international Medical/Clinical laboratory quality standards
- Explain the principle of radioactive detection and safety issues according to SOP
- Understand the definitions and principles related to supply chain management
- Acquire understanding and knowledge of project management skills, centralized procurement and tracking of supplies and logistics
- Understand the process of supply chain management and logistics system
- Understand information technology, automation knowledge, electronic business and electronic purchases, catalogue reading and product searching
- Understand business ethics and Understand any local or national government requirements that need to be accommodated in the contracts
- Discuss the basic principles of resources mobilization and efficient resources utilization
- Understand the principle of receiving, inspecting, testing, storing, and handling of materials
- Perform routine and advanced biochemical, bacteriological, virological, mycological, parasitological, hematological, immunologic, and molecular tests, on clinical, environmental, drugs, toxins and specimens of public importance.
- Participate and contribute in surveillance and control of communicable disease and information dissemination in diseases outbreak situations.
- Assist, participate and conduct operational and basic research and involve in development of new medical laboratory diagnostic technologies.
- Establish and monitor programs to ensure the accuracy of tests.
- Plan and monitor laboratory logistic procurement, evaluation, setup, auditing and safe disposal
- Provide professional services, leadership and quality assurance in clinical/public health laboratories
- Monitor and maintain proper functioning of medical laboratory equipment/reagents
- Collect, preserve, store and transport referral specimens for proper and safe testing
- Communicate effectively both verbally and non-verbally to develop good working network and integrate multiple systems
- Collect, document, retrieve and interpret laboratory data clearly and safely.
- Undergo method selection process and prepare acceptance criteria for supplies and equipment after procurement
- Review all contracts to make sure the laboratory's requirements are being met.
- Follow-up the logistics system
- Maintain the medical laboratory ethical code of conduct standards and contribute to stewardship of their profession
- Adhere to Laboratory standard operative procedures while performing tests
- Advocate the proper use of laboratory tests.
- Promote safety, quality control and quality assurance in clinical and public health

laboratories

- Participate in policy, professional standards, continuing professional development issues pertaining to medical laboratory profession
- Respectful, compassionate and caring to patients, their relatives and other professionals
- Practice constant learning and thorough understanding
- Adhere and follow standards for products specification, quantification, inventory management, storage and distribution of laboratory equipment and supplies
- Aspire accreditation as important as service delivery

3. COMPETENCIES AND LEARNING OUTCOMES

Graduates of this program will be able to be competent in terms of knowledge, skill and attitude domain:

3.1. Competencies

3.1.1. Knowledge

- Identify the chemical characteristics of different chemical compounds and solutions.
- Identify appropriate anatomic sites for biological sample collection.
- Identify structure, functions and biochemical contents of cells and organs
- Identify factors that affect procedures and test results, and suggest appropriate action within predetermined limits.
- Understand pathogenesis and diagnostic principles and methods of bacterial, viral, fungal and parasitic diseases.
- Recognize the physiological and pathological conditions which may affect the biochemical and hematological parameters.
- Identify the operating procedures of laboratory instruments and equipment/reagents.

3.1.2. Skill

- Prepare stock and working laboratory solution of different concentrations.
- Perform patient identification, proper specimen collection, handling, processing and storage for onsite analysis and sample referral as per standard operating procedure.
- Perform molecular tests on clinical specimens as per standard operating procedure.
- Perform immunological assays on clinical specimens as per standard operating procedure.
- Perform serological assays on clinical specimens as per standard operating procedure.
- Perform parasitological tests as per standard operating procedure.
- Identify public health important vectors and apply integrated vector control strategies.
- Perform hematological tests on clinical specimens as per standard operating procedure.

- Perform immune-hematological tests on clinical specimens as per standard operating procedure.
- Perform histopathological techniques on tissue specimen for histopathological investigation.
- Perform bacteriological tests on clinical specimens as per standard operating procedure.
- Perform virological tests on clinical specimens as per standard operating procedure.
- Perform Mycological tests on clinical specimens as per standard operating procedure.
- Perform clinical chemistry tests on clinical specimens as per standard operating procedure.
- Perform Urine and body fluid analysis as per standard operating procedure.
- Perform toxin analysis using different methods and instruments following standard operating procedure.
- Use automated equipment and instruments capable of performing a number of tests simultaneously.
- Interpret, report, and document laboratory test results correctly.
- Perform specimen collection, processing, transport, storage, and analysis during disease outbreak and surveillance according to standard operating procedure.
- Collect, process, transport, store and analyze food, water, beverages and other environmental samples for communicable disease prevention and control as per the standard operating procedures.
- Interpret, report, and document public health laboratory test results correctly
- Apply computer skills for data storage, analysis and report generation.
- Evaluate test results and methods; develop and update standard operating procedures to ensure the accuracy of tests.
- Practice safety precautions and safe disposal of wastes in the laboratory

3.1.3. Attitude

- Apply medical laboratory ethical code of conduct and contribute to the stewardship of their profession.
- Implement laboratory standard operating procedures while performing tests.
- Value compassionate, respectful, and caring behavior at the individual and family level
- Design and implement quality enhancement plan to ensure the delivery of quality laboratory services.
- Promote and apply laboratory safety practices and standard operating procedures.
- Manage common accidents in the laboratory.
- Apply international Medical laboratory quality standards.
- Confirm and verify laboratory test results through in-depth knowledge of scientific methods, principles and instrumentation theory.
- Monitor and maintain proper functioning of medical laboratory equipment and reagents

3.2. Learning outcomes

After completion of this program, students are expected to:

- Apply the basic principles of specimen collection for laboratory practice
- Apply the principles of sterilization and disinfection for laboratory works
- Apply the working principles of spectrophotometers, cell counting, automations, electrophoresis, electrochemical techniques, and chromatographs radioactive detection.
- Perform immunologic marker typing on Immune cells
- Apply basic principles of serological and Immunological techniques for the diagnosis of parasitic, bacterial and viral infections
- Perform specific and non-specific serological tests as per the standard operating procedure
- Perform manual Reticulocyte, differential and total cell count on whole blood and body fluids
- Perform Hematocrit, Hemoglobin and ESR determination
- Recognize Normal and abnormal morphology of red blood cells
- Perform Bone marrow smear preparation and staining
- Diagnose nonmalignant leukocyte disorders, its causes and laboratory diagnosis.
- Diagnose leukemia, its classification and laboratory diagnosis
- Detection of blood group antigens and antibody reactions
- Perform ABO and Rh phenol typing and discrepancy
- Perform minor blood group phenotyping
- Perform compatibility (cross-match), Anti-globulin and testing
- Perform transfusion transmitted disease screening
- Apply the principles of collection, transportation, processing and preservation of blood and blood components for transfusion
- Prepare blood components, and derivatives for transfusion.
- Explain hemolytic diseases of the fetus and newborn and its laboratory investigation (HDFN)
- Involve in collection, transportation, & storage of clinical specimen collected for bacteriological analysis
- Discuss the common pathogenic gram-positive cocci and gram-negative bacteria (pathogenicity, clinical manifestations, laboratory diagnosis, prevention & controlling methods).
- Perform cultivation of gram-positive and gram-negative bacteria
- Identify gram positive and gram-negative bacteria based on morphology, growth characteristics, biochemical test &others

- Perform antibacterial susceptibility testing for gram positive and gram-negative bacteria
- Perform RPR, VDRL, and TP ABS etc.
- Perform other serologic and molecular diagnostic techniques for Treponema species and Borriella species
- Discuss the common pathogenic mycobacterium species (pathogenicity, clinical manifestations, laboratory diagnosis, prevention & controlling methods)
- Perform TB culture using Lowenstein Janson media and other culturing methods
- Perform molecular diagnostic techniques for MTB
- Discuss the other pathogenic bacteria (pathogenicity, clinical manifestations, laboratory diagnosis, prevention & controlling methods)
- Perform bacteriological analysis on sample collected from disease outbreak site
- Discuss food microbiology and food borne diseases
- Perform bacteriological water analysis
- Perform collection, processing of clinical specimen in virology
- Discuss common pathogenic DNA and RNA viruses (pathogenicity, clinical manifestations, laboratory diagnosis, prevention & controlling methods)
- Perform common methods in the diagnosis of HBV, HCV, influenza virus, Rota virus, Rubella virus and other viruses
- Perform common viral diagnosing methods (PCR, Serology & culture)
- Discuss Hepatitis virus species (pathogenicity, clinical manifestations, laboratory diagnosis, prevention& controlling methods)
- Perform common methods in the diagnosis of HIV virus like viral load and CD4+ count
- Discuss medically important superficial, subcutaneous, cutaneous, systemic and opportunistic mycoses
- Discuss the etiological agents, epidemiology, and mode of transmission, pathogenesis clinical picture and laboratory diagnosis of superficial, subcutaneous, cutaneous, systemic and opportunistic mycoses.
- Perform diagnosis of superficial, subcutaneous, cutaneous, systemic and opportunistic mycoses
- Determine different clinical chemistry biochemical analytes according standard operating procedures and manufacturers 'instructions
- Demonstrate adherence to policies and procedures in clinical chemistry laboratory
- Perform physical, chemical and microscopic examination of urine
- Maintain specimen integrity in the laboratory
- Apply standard operating procedure update SOPs regularly
- Apply quality control to monitor and maintain proper functioning of medical laboratory equipment and reagents.
- Prepare specification of equipment, chemicals, supplies and other logistics

4. CATEGORIZATION OF COURSES TO BE INCLUDED

National Exit Examination in medical laboratory program for undergraduate students will have five main themes. These are Basic medical Laboratory Sciences, Hematology, Microbiology and Parasitology, Clinical Chemistry, Laboratory Management and Quality Assurance. Under each themes different modules are listed as indicated in the table below.

S. No	Themes	List of Modules	ECTS
1.	Basic medical Laboratory Science	Molecular Biology and Applied Genetics	8
		Basic to Medical Laboratory Sciences	12
		Immunology and serology	10
2.	Hematology	Hematology and Immunohematology	19
		Histopathology	3
3.	Microbiology and Parasitology	Medical Parasitology and Vector Biology	17
		Medical Bacteriology and Public Health Microbiology	17
		Medical Virology	5
		Medical Mycology	3
4.	Clinical Chemistry	Clinical Chemistry and Toxin Analysis	17
		Urine and Body Fluid Analysis	7
5.	Laboratory Management and Quality Assurance	Quality Assurance in Medical Laboratory	3
		Health Laboratory Management	3

5. CONCLUSION

Provision of quality medical education is an essential tool to have quality health professionals and to maintain quality health system in the country. To this extent, assessment of final year undergraduate program students on the three main domains (knowledge, attitude, and practice) before leaving the HEIs and joining the health professional job is mandatory. Thus, the present Medical Laboratory Science undergraduates' program national exit exam encompasses the thirteen core modules of medical laboratory science program and will assesses the prospective graduate students whether adequately acquired the five main themes. As a result, it enables the Medical Laboratory Science graduates eligible to have professional licenses, and confidences in their future professional careers. Besides this national exit exam will make potential employers to develop trust and get competent & productive medical laboratory science workforces.

Validated By:

1. Solomon Gebre (MSc, Lecturer, WCU)
2. Mikias Abebe (MSc, Assistant Professor, WU)