

Medical Laboratory Technology Program
Student Learning Outcomes &
Course Descriptions with Learning Objectives

Medical Laboratory Technology Student Learning Outcomes

All Colorado Mesa University associate graduates are expected to demonstrate proficiency in critical thinking, communication fluency, quantitative fluency, and specialized knowledge/applied learning. In addition to these campus-wide student learning outcomes, graduates of the medical laboratory technology major will be able to:

1. Demonstrate the theoretical knowledge and technical skills in the performance of routine laboratory testing. (Specialized Knowledge/Applied Learning)
2. Demonstrate error recognition and the ability to integrate and interpret analytical data and establish a course of action to solve problems. (Critical Thinking)
3. Communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public. (Communication Fluency)
4. Apply mathematical calculations and statistical methods to ensure the accuracy of laboratory test results. (Quantitative Fluency)
5. Demonstrate laboratory practice standards in safety, professional behavior and ethical conduct. (Specialized Knowledge/Applied Learning)

Course Descriptions and Learning Objectives

MLTP 101 Phlebotomy course is designed for the student to gain knowledge and skills necessary to obtain patient samples for laboratory testing. Emphasis is placed on venipuncture and dermal collections. Skills necessary for limiting pre-analytic errors with sample collections and processing, as well as knowledge of POC testing, patient collection instructions, send out testing and informatics are learned. Review of regulatory, ethical and legal issues, healthcare delivery system, certification and licensure, organ systems, basic medical terminology, infection prevention, and professionalism are covered as well.

Course learning objectives:

1. Demonstrate a working comprehension of the technical and procedural aspects of laboratory testing, safety and ethical standards of practice.
2. Explain and apply basic principles of medical terminology, safety measures, universal precautions, infection control and potential sources of error as they relate to standard laboratory operating procedures and quality patient care.
3. Demonstrate technical skills by following established procedures for collecting and processing biological specimens for analysis.
4. Recognize unexpected results and instrument malfunction and take appropriate action for resolution.
5. Calculate, document, interpret quality control data, and resolve out of control situations.
6. Demonstrate professional communication of laboratory information to patients, physicians and other authorized sources utilizing a variety of formats which may include, laboratory information systems, computer technologies, telecommunications and direct patient conversation.
7. Demonstrate proficiency in laboratory technical skills through performance and instruction of other laboratory personnel.

MLTP 102 Applied Phlebotomy course provides the student with a clinical experience at a limited number of CMS accredited affiliate sites in western Colorado. In order to complete the clinical experience, students may have to travel

or relocate out of Grand Junction. Students enrolled in the course will be oriented to the clinical lab areas and workflow for a total of 100 hours. Additionally, the successful student will have performed 100 unaided successful venipunctures and eight dermal collections in order to meet the minimum requirements set forth by ASCP for phlebotomy certification.

Course learning objectives:

1. Demonstrate a working comprehension of the technical and procedural aspects of laboratory testing, safety and ethical standards of practice.
2. Explain and apply basic principles of medical terminology, safety measures, universal precautions, infection control and potential sources of error as they relate to standard laboratory operating procedures and quality patient care.
3. Demonstrate technical skills by following established procedures for collecting and processing biological specimens for analysis.
4. Demonstrate professional communication of laboratory information to patients, physicians and other authorized sources utilizing a variety of formats which may include, laboratory information systems, computer technologies, telecommunications and direct patient conversation.
5. Demonstrate proficiency in phlebotomy skills through performance and instruction of other laboratory personnel. Develop and demonstrate professional attitudes, behaviors and practice.

MLTP 138 and MLTP 138L Clinical Immunology and Lab courses provide the student with fundamentals and procedures of the immune defenses as it relates to medical laboratory testing; innate and adaptive immune responses, deficiencies, autoimmunity, hypersensitivity and tissue transplantation. Exploration of serologic techniques and instrumentation in the detection and diagnoses of viral illness, immune related diseases and it's applications in immunohematology. Introduction to theories and principles of molecular testing methods.

Course learning objectives:

1. Describe components of the immune system, their functional interactions and physiology as it relates to immunity, disease states and disorders.
2. Perform serologic assays using a variety of techniques, evaluate clinical data, interpret results, and correlate abnormal results with disease states.
3. Monitor and evaluate quality assurance data, identify errors and formulate plan for corrective action.
4. Evaluate patient specimen acceptability for serological analysis.
5. Operate clinical instruments, evaluate results, identify errors and resolve malfunctions.
6. Critique patient results and select appropriate follow-up tests.
7. Compare and contrast clinical laboratory procedures, interpret data and predict diagnosis.
8. Explain the principles and applications of molecular assays.

MLTP 142 and MLTP 142L Clinical Microscopy and Lab courses provide the student with an introduction to microscopy in the medical laboratory. Emphasis on kidney function and urine formation: examination of the physical, chemical and microscopic components of urine. Body fluid analysis of: feces, seminal, vaginal, amniotic, cerebrospinal, serous, and synovial fluids. Critical analysis and problem solving with regards to pre-analytic, analytic and post-analytic variables in sample testing.

Course learning objectives:

1. Compare and contrast various types of microscopic techniques and their laboratory application.
2. Describe the anatomy of the kidney and relate its structure to the process of urine formation.
3. Perform and interpret urine tests, detect abnormalities, assign a diagnosis and prescribe follow-up testing.
4. Describe how fluids such as spinal fluid, serous fluid, synovial fluid and amniotic fluid are formed.

5. Perform and interpret body fluid tests, detect abnormalities, assign a diagnosis and prescribe follow-up testing.

MLTP 231 and MLTP 231L Clinical Microbiology I and Lab courses provide the student with the study of normal flora and pathogenic microorganisms. Methods for recovery, identification of pathogens, culture techniques, procedures, antibiotic testing, automation and interpretation of clinical data. Emphasis on clinical specimens, testing algorithms and data correlation including diagnostics, public health, safety and quality control.

Course learning objectives:

1. Evaluate patient specimen acceptability for analysis.
2. Correlate clinical signs and symptoms associated with diseases caused by bacterial pathogens
3. Distinguish between normal flora and pathogenic organisms based upon colony characteristics.
4. Monitor and evaluate quality assurance data, identify errors and formulate plan for corrective action.
5. Characterize key microscopic and macroscopic features of bacterial pathogens.
6. Perform and interpret various staining techniques.
7. Justify appropriate media for the cultivation of pathogens.
8. Compare and contrast clinical laboratory procedures, interpret data and predict the pathogen isolated.
9. Compare different antibiotic susceptibility test methods, interpret results of antimicrobial susceptibility tests and correlate with patient therapy.
10. Analyze unknown pathogens, select appropriate test methods, interpret results, and report out identification.
11. Critique patient results and select appropriate follow-up tests

MLTP 132 and MLTP 132L Clinical Hematology/Coagulation and Lab courses provide the student with an introduction to the theory and practical application of hematology and hemostasis (coagulation) systems as it relates to the medical laboratory. Bone marrow, blood cell formation, hemoglobin structure and synthesis, cell function and morphology, and coagulation are explored. Correlation of test results with normal results, blood cell disorders and clotting abnormalities emphasized. Laboratory techniques, instrumentation, and quality assurance in the hematology/hemostasis lab.

Course learning objectives:

1. Distinguish normal and abnormal microscopic characteristics of blood cells through performance of a complete blood count.
2. Perform manual and automated testing, assess laboratory data and predict the diagnosis of hematological and coagulation disorders and diseases.
3. Correlate hematological findings with those generated in other areas of the clinical laboratory.
4. Describe the origin and development of platelets.
5. Relate platelet structure to physiology and function.
6. List coagulation factors and describe their function in fibrin formation.
7. Distinguish modes of action and therapeutic use of anticoagulants.
8. Associate hemostatic dysfunction with clinical disease.

MLTP 141 and MLTP 141L Clinical Immunohematology and Lab courses provide the student with theoretical principles and procedures in immunohematology and application in the medical laboratory. Blood banking procedures and potential problems in blood bank testing relative to antibody identification, compatibility testing, transfusion reactions and maternal/neonatal screening for hemolytic disease of the newborn.

Course learning objectives:

1. Evaluate patient specimen acceptability for analyses.

2. Differentiate mechanisms of immune response.
3. Relate immunologic theory to performance of procedures in the blood bank and serology laboratory.
4. Describe characteristics of common blood group systems, perform and interpret ABO blood grouping and Rh typing and resolve ABO discrepancies.
5. List the types of component therapy and perform and interpret compatibility testing, antibody identification, prenatal and postnatal testing, with identification of errors and resolution of discrepancies.
6. Describe appropriate pre- and post-transfusion testing associated with components.
7. Describe pathophysiology and laboratory investigation of transfusion reactions and hemolytic disease of the newborn.
8. Describe mechanisms associated with altered immune response.
9. Discuss principles and procedures associated with tissue transplantation.
10. Critique patient results and select appropriate follow-up tests.
11. Monitor and evaluate quality assurance data, identify errors and formulate plan for corrective action.
12. Demonstrate traits in organizational skills, work habits, attitude, interpersonal skills, and problem-solving ability.

MLTP 232 and MLTP 232L Clinical Microbiology II and Lab courses provide the student with an introduction to basic laboratory identification and classification of medically significant isolates in mycology, parasitology and virology. Laboratory safety, specimen selection and processing, isolation methods, immunologic diagnosis and treatment. Epidemiology and pathogenesis of mycosis, parasitic and viral infections are explored.

Course learning objectives:

1. Evaluate patient specimen acceptability for analysis.
2. Correlate clinical signs and symptoms associated with diseases caused by pathogens
3. Perform and prepare blood films, wet mounts, concentration methods and staining methods for blood and tissue parasites.
4. For major human pathogens, describe mechanism of pathogenesis, clinical symptoms, treatment and prevention.
5. Identify and describe the morphology and the life cycle, including infective stage and diagnostic stage of each parasitic organism presented.
6. Describe characteristics and structures of fungi.
7. Characterize the mycoses and define the tissues they affect: superficial, cutaneous, subcutaneous, systemic and opportunistic.
8. Analyze the appropriate specimen collection procedures, staining methods, and culture techniques use in the mycology laboratory.
9. Describe characteristics of viruses and differentiate from bacteria.
10. Explain indications and limitations of conventional cell cultures, rapid viral antigen detection and serologic assays in the diagnosis of viral infections.
11. Monitor and evaluate quality assurance data, identify errors and formulate plan for corrective action.
12. Analyze unknown pathogens, select appropriate test methods, interpret results, and report out identification.
13. Critique patient results and select appropriate follow-up tests

MLTP 242 and MLTP 242L Clinical Chemistry and Lab courses provide the student with the application of human pathophysiology and how it relates to laboratory testing. Cardiovascular disease, kidney function, acid-base metabolism, liver, bone, carbohydrate disorders, endocrine, malignancy, and exogenous substances. Exploration of measurement methodologies: instrumentation, reagents and reactions, standards and control usage in quality

assurance. Critical analysis and problem solving with regards to pre-analytic, analytic and post-analytic variables in sample testing.

Course learning objectives:

1. Perform, interpret and evaluate patient data and chemistry procedures given the proper procedures, reagents and equipment.
2. Perform, interpret and evaluate, necessary quality control and calibration procedures related to chemistry procedures given the proper procedures, reagents and equipment.
3. Explain and advocate the significance and value of quality control as it relates to quality assurance and patient care.
4. Perform, interpret, and initiate normal preventative maintenance on chemistry analyzers given the proper procedures, reagents and equipment.
5. Describe the basic biochemistry, physiology and pathology relevant to the practice of clinical laboratory medicine.
6. Describe concepts of clinical chemistry, testing methods, and correlate laboratory data with mechanisms of disease processes.
7. Describe key points of laboratory safety as it applies to clinical chemistry.
8. Describe various types of instruments, physical chemistry and techniques used in clinical chemistry analysis.
9. Describe the fundamental principles used in clinical instrument designs.
10. Compare, contrast and evaluate clinical instrument methodologies.
11. Describe techniques and statistical procedures that can be used to evaluate clinical data.
12. Relate the mechanisms and symptoms of toxicity to therapeutic drug monitoring and exposure to toxic substances.
13. Correlate pharmacokinetics to therapeutic drug monitoring.
14. Describe the biologic function of trace elements and vitamins and relate clinical findings to conditions associated with decreased or increased levels.
15. Correlate laboratory detection of tumor markers with cancers and metastatic disease

MLTP 272 Capstone Seminar course prepares the student for clinical internships and the workplace. Conflict resolution, communication skills, safety, professional behavior in the workplace, resume writing and interview skills.

Course learning objectives:

1. Demonstrate conflict resolution skills.
2. Communicate effectively in the workplace.
3. Identify professional behaviors expected in the healthcare workplace.
4. Develop a professional resume.
5. Demonstrate confidence in a professional interview.
6. Discuss key safety principles in the healthcare workplace environment.
7. Identify expectations for performance during internship placements.

MLTP 180,182,250,252 Applied Experience provides the student a clinical laboratory experience in the principles and procedures of clinical immunology, urinalysis and body fluids, microbiology, hematology and coagulation, immunohematology and chemistry. It is an on-line supported, off campus clinical laboratory experience at an affiliated site. Emphasis is placed on the application of knowledge and technical skills to clinical testing, methodology, instrumentation, quality control, correlation of laboratory data with pathophysiology, following OSHA practices and healthcare professionalism.

Course learning objectives:

1. Evaluate patient specimen acceptability for analyses.
2. Report patient results according to established department protocol.

3. Correlate patient results with patient's condition.
4. Perform and interpret various laboratory procedures.
5. Operate clinical instruments, evaluate results, identify errors and resolve malfunctions.
6. Monitor and evaluate quality assurance data, identify errors and formulate plan for corrective action.
7. Critique patient results and select appropriate follow-up tests.
8. Professionally communicate laboratory information to patients, physicians and other authorized sources utilizing a variety of formats which may include, laboratory information systems computer technologies, telecommunications and direct patient conversation.
9. Develop and demonstrate professional attitudes, behaviors and practice.
10. Student will follow OSHA safety precautions while performing laboratory duties.

MLTP 253 Certification Exam Review course provides the student with a review of key principles and content in preparation for national certification examination.

Course learning objectives:

1. Identify key principles and practices in medical laboratory practice in:
 - a. Clinical Immunology
 - b. Clinical Microscopy
 - c. Clinical Microbiology
 - d. Clinical Hematology/Hemostasis
 - e. Clinical Immunohematology
 - f. Clinical Chemistry