American Society for Clinical Pathology
Board of Certification

**VALID ONLY FOR MLT(ASCP$^i$) TESTING DATES UP TO AND INCLUDING SEPTEMBER 30, 2014**

# INTERNATIONAL MEDICAL LABORATORY TECHNICIAN, MLT(ASCP$^i$)

EXAMINATION CONTENT GUIDELINE

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This document should serve as a useful guide for examination preparation. The Board of Certification criterion-referenced examinations are constructed to measure the competencies described in the Certification Levels Definitions. These competency statements are specified into task definitions, linked to each of the content outlines, and measured by the test items.

It should be noted that, for the medical laboratory technician, the Certification Levels Definitions refer to skills and abilities expected at career entry, not those that may be acquired with subsequent experience.

## TECHNICIAN LEVEL

**Knowledge**

The technician has a working comprehension of the technical and procedural aspects of laboratory tests. The technician maintains awareness and complies with safety regulations and ethical standards of practice. The technician correlates laboratory tests to disease processes and understands basic physiology recognizing appropriate test selection and abnormal test results.

**Technical Skills**

- *Follows established procedures for collecting and processing biological specimens for analysis.*
- *Performs chemical, microbiologic, immunologic, hematologic and immunohematologic laboratory procedures that require limited independent judgement.*

The technician comprehends and follows procedural guidelines to perform laboratory tests to include (1) specimen collection and processing; (2) instrument operation and troubleshooting; (3) result reporting and record documentation; (4) quality control monitoring; (5) computer applications and (6) safety requirements.

**Problem Solving and Decision Making**

- *Recognizes unexpected results and instrument malfunction and takes appropriate action.*

The technician recognizes the existence of procedural and technical problems and takes corrective action according to predetermined criteria or refers the problem to the appropriate supervisor. The technician prioritizes test requests to maintain standard patient care and maximal efficiency.

**Communication**

- *Provides laboratory information to authorized sources.*

The technician communicates specimen requirements, reference ranges, and test results, and prepares drafts of procedures for laboratory tests according to a standard format.

**Teaching and Training Responsibilities**

- *Demonstrates laboratory technical skills to other laboratory personnel*

The technician trains new technicians and students and maintains technical competence.


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## THE EXAMINATION MODEL

The Board of Certification criterion-referenced examination model consists of three interrelated components:

**COMPETENCY STATEMENTS** describe the skills and tasks that Medical Laboratory Technicians should be able to perform.

**CONTENT OUTLINE** delineates general categories or subtest areas of the examination.

**TAXONOMY** levels describe the cognitive skills required to answer the question.

| | |
|---|---|
| **Level 1 - Recall:** | Ability to recall or recognize previously learned (memorized) knowledge ranging from specific facts to complete theories. |
| **Level 2 - Interpretive Skills**: | Ability to utilize recalled knowledge to interpret or apply verbal, numeric or visual data. |
| **Level 3 - Problem Solving**: | Ability to utilize recalled knowledge and the interpretation/application of distinct criteria to resolve a problem or situation and/or make an appropriate decision. |

## EXAMINATION REPORTING MECHANISMS

After the examination administration, preliminary test results (pass or fail) will appear on the computer screen. An official examination performance report will be emailed to the examinee within 10 business days of the examination administration, provided all official documents have been received.

The examinee Performance Report provides the scaled score on the total examination and pass/fail status for all candidates. In addition, failing candidates receive scaled scores for each subtest (see content outline for subtests). This information may help the examinee identify areas of strengths and weaknesses in order to develop a study plan for future examinations. A total scaled score of 400 is required to pass the examination.

# COMPETENCY STATEMENTS

INTERNATIONAL MEDICAL LABORATORY TECHNICIAN

For the laboratory areas of Body Fluids, Blood Bank, Chemistry, Hematology, Immunology and Microbiology, and in accordance with established procedures, the following competencies are tested:

**APPLIES KNOWLEDGE OF**

- theory and principles related to:
  - anatomy (Body Fluids)
  - biochemistry (Chemistry and Hematology)
  - growth characteristics/diagnostic and infective forms (Microbiology)
  - immunology (Blood Bank and Immunology)
  - physiology (Body Fluids, Chemistry, Hematology, Immunology)
  - laboratory information systems
- data security/patient confidentiality
- fundamental biological characteristics related to laboratory testing
- medical terminology
- principles of performing basic/special laboratory procedures
- sources of error in laboratory testing
- standard operating procedures
- theory and practice related to laboratory operations (safety)

**SELECTS APPROPRIATE**

- controls for test performed
- course of action
- instruments to perform requested test
- quality control procedures
- reagents/media/blood products
- routine/special procedures to verify test results
- type of sample and method for test requested

**PREPARES / PROCESSES**

- controls
- equipment and instruments
- reagents/media/blood products
- specimens

**CALCULATES RESULTS**

**ASSESSES TEST RESULTS BY CORRELATING LABORATORY DATA WITH**

- clinical or other laboratory data
- physiologic processes to validate test results and procedures
- quality control data
- results obtained by alternate methodologies

**EVALUATES**

- appropriate actions and methods
- corrective actions
- patient-related requirements
- possible sources of error or inconsistencies
- quality control procedures
- specimen-related requirements

**EVALUATES LABORATORY DATA TO**

- assure personnel safety
- check for common procedural/technical problems
- recognize and report abnormal test results and/or the need for additional testing
- recognize possible inconsistent results/sources of error
- recognize related disease states
- take corrective action according to predetermined criteria
- verify test results for reporting

# CONTENT OUTLINE

INTERNATIONAL MEDICAL LABORATORY TECHNICIAN

*Refer to the MLT Competency Statements for the competencies tested in each subtest.*

**I. BLOOD BANK (20% of total exam)**

**1. ABO and Rh**
- A. ABO
- B. Rh

**2. Antibody Screen and Identification**
- A. Antibody Screen
- B. Antibody Identification
  - 1) Duffy
  - 2) Ii
  - 3) Kell
  - 4) Kidd
  - 5) Lewis
  - 6) MNS
  - 7) P
  - 8) Rh
  - 9) Multiple antibodies

**3. Crossmatch and Special Tests**
- A. Crossmatch
- B. Special Tests
  - 1) DAT
  - 2) Phenotyping and genotyping
  - 3) Elution/absorption
  - 4) Antibody titer
  - 5) Pre-warm technique
  - 6) Rosette

**4. Blood Donation, Transfusion therapy, Transfusion Reactions and Hemolytic Disease of the Newborn (HDN)**
- A. Donor Donation
  - 1) Donor Requirements
- B. Transfusion Therapy
  - 1) RBC
  - 2) PLT
  - 3) FFP
  - 4) Cryoprecipitated AHF
  - 5) RhIG
- C. Transfusion Reactions
- D. HDN

**II. URINALYSIS & OTHER BODY FLUIDS (9% of total exam)**

**1. Urinalysis**
- A. Pre-Analytical
- B. Physical
  - 1) Color and clarity
  - 2) Specific gravity/osmolality
- C. Chemical
  - 1) Reagent strip
  - 2) Confirmatory tests
- D. Microscopic Urinalysis
  - 1) Cells
  - 2) Casts
  - 3) Crystals
  - 4) Contaminants/artifacts/microorganisms
- E. Complete Urinalysis (includes physical, chemical and microscopic)
- F. Physiology

**2. Other Body Fluids**
- A. CSF
- B. Amniotic, Gastric, and Synovial Fluids, Serous Body Fluids, Semen and Feces

**III. CHEMISTRY (23% of total exam)**

**1. Carbohydrates, Acid Base and Electrolytes**
- A. Carbohydrates
  - 1) Glucose
  - 2) Glycosylated hemoglobin
  - 3) Other carbohydrates (e.g. lactate)
- B. Acid Base
  - 1) pH, $pCO_2$, $pO_2$
  - 2) Osmolality, base excess
- C. Electrolytes
  - 1) Sodium, potassium, chloride, bicarbonate, anion gap
  - 2) Calcium, magnesium, phosphorus

**2. Proteins and Other Nitrogen-Containing Compounds**
- A. Protein and Other Nitrogen-Containing Compounds
  - 1) Total protein, albumin
  - 2) Globulins (alpha 1, alpha 2, beta, gamma)
  - 3) Ferritin, transferrin
  - 4) Iron and TIBC
  - 5) Ammonia
  - 6) Creatinine, BUN
  - 7) Uric acid
  - 8) Troponin
  - 9) Other
- B. Heme Derivatives
  - 1) Hemoglobin (S, fetal $A_2$, plasma)
  - 2) Bilirubin, urobilinogen
  - 3) Other (e.g., myoglobin)

3. **Enzymes, Lipids and Lipoproteins**
   A. Enzymes
      1) Amylase, lipase
      2) AST, ALT
      3) CK, LD
   B. Lipids and Lipoproteins
      1) Cholesterol (total, HDL, LDL)
      2) Triglycerides
      3) Phospholipids
      4) Other lipids and lipoproteins
4. **Special Chemistry (Endocrinology, Tumor Markers, TDM, Toxicology)**
   A. Endocrinology and Tumor Markers
      1) $T_3$, $T_4$, TBG, TSH
      2) hCG, FSH, LH, estriol, estradiol
      3) Other hormones (e.g., cortisol)
      4) Tumor markers (alpha fetoprotein, CEA, hCG, PSA)
   B. TDM and Toxicology
      1) Therapeutic drug monitoring
      2) Drugs of abuse
      3) Other toxicology (e.g., lead)

**IV. HEMATOLOGY (21% of total exam)**

1. **Erythrocytes and Leukocytes**
   A. Red Blood Cells and Indices
      1) RBC count
      2) Hemoglobin, hematocrit and indices
   B. White Blood Cell Count
   C. CBC (includes count, morphology and/or differential)
2. **Other Tests**
   A. Reticulocyte Count and Other RBC Inclusions
   B. ESR
   C. Tests for Hemoglobin Defects (e.g., sickle cell tests)
   D. Other
3. **Morphology and Differentials**
   A. Red Blood Cell Morphology
   B. White Blood Cell Morphology
   C. Differential
   D. Platelet Morphology
4. **Platelets and Hemostasis**
   A. Platelets
      1) Platelet count
      2) Bleeding time
   B. Hemostasis
      1) PT, aPTT, TT
      2) Fibrinogen, FDP, D-dimer
      3) Factor assays, antithrombin III
      4) Circulating anticoagulants
      5) Mixing studies
      6) Anticoagulant therapy
      7) Other

**V. IMMUNOLOGY (7% of total exam)**

1. **Immunity**
   A. Autoimmunity
      1) ANA, anti-DNA
      2) Thyroid antibodies
   B. Pre-Analytical, Test Principles
2. **Infectious Diseases**
   A. Viral
      1) EBV/infectious mononucleosis
      2) Hepatitis
      3) HIV/HTLV/CMV
      4) Rubella/measles
      5) Other viruses
   B. Microbial
      1) Cold agglutinins
      2) Syphilis
      3) Other microorganisms

**VI. MICROBIOLOGY (20% of total exam)**

1. **General Bacteriology and Aerobic Gram-positive Cocci**
   A. General Bacteriology (e.g., pre-analytical, biochemical and susceptibility testing)
   B. Aerobic Gram-positive Cocci: *Staphylococcus, Streptococcus*, *Enterococcus*, other (e.g., *Micrococcus, Leuconostoc*)
2. **Gram-negative Bacilli**
   A. *Enterobacteriaceae: Citrobacter*, *Escherichia, Enterobacter, Klebsiella*, *Morganella, Proteus, Providencia*, *Salmonella, Serratia, Shigella, Yersinia*
   B. Other Gram-negative Bacilli: *Acinetobacter, Aeromonas, Bordetella, Brucella*, *Campylobacter, Eikenella, Francisella, Haemophilus, Helicobacter, Legionella, Pasteurella, Plesiomonas, Pseudomonas, Burkholderia, Chryseobacterium, HACEK Stenotrophomonas, Vibrio*
3. **Gram-negative Cocci, Gram-positive Bacilli and Anaerobes**
   A. Aerobic Gram-negative Cocci: *Neisseria, Moraxella*
   B. Aerobic or Facultative Gram-positive Bacilli: *Bacillus, Corynebacterium*, *Erysipelothrix, Gardnerella, Lactobacillus*, *Listeria, Norcardia, Streptomyces*
   C. Anaerobes
      1) Gram-positive: *Bifidobacterium*, *Actinomyces, Clostridium, Eubacterium*, *Peptostreptococcus, Propionibacterium*
      *2)* Gram-negative: *Bacteroides*, *Fusobacterium, Porphyromonas*, *Prevotella, Veillonella*

4. **Fungus, Viruses, Mycobacteria and Parasites**
   A. Fungi
      1) Yeast (e.g., *Candida, Cryptococcus, Geotrichum*)
      2) Dimorphic fungi (e.g., *Blastomyces*, *Coccidioides, Histoplasma, Sporothrix*)
      3) Dermatophytes (e.g., *Epidermophyton*, *Microsporum, Trichophyton*)
      4) Zygomycetes (e.g., *Absidia, Mucor, Rhizopus*)
      5) Opportunistic molds, septate hyaline molds (e.g., *Aspergillus, Penicillium*)
   B. Mycobacteria
      1) *Mycobacterium tuberculosis* complex (e.g.,. *M. tuberculosis*)
      2) Other Mycobacteria (e.g., *M. avium*, *M. avium-intracellulare*, *M. fortuitum*, *M. gordonae*, *M. kansasii*, *M. leprae*, *M. marinum*, *M. scrofulaceum*)
   C. Viruses and Other Microorganisms
      1) Viruses (e.g., Cytomegalovirus, Herpes simplex, Influenza, Varicella-zoster)
      2) Other microorganisms (e.g., *Chlamydia* and *Mycoplasma*)
   D. Parasites
      1) Blood and tissue protozoa (e.g., *Plasmodium, Pneumocystis, Trypanosoma*)
      2) Intestinal and urogenital protozoa (e.g., *Cryptosporidium, Entamoeba, Giardia,* and *Trichomonas*)
      3) Intestinal and tissue helminths (e.g., *Ascaris, Enterobius,* hookworm*, Schistosoma, Taenia, Trichinella, Trichuris*)

*All Board of Certification examinations use conventional units for results and reference ranges.*

**END OF CONTENT GUIDELINE**