

# MEDICAL LABORATORY SCIENTIST, MLS(ASCP) INTERNATIONAL MEDICAL LABORATORY SCIENTIST, MLS(ASCP)<sup>i</sup> EXAMINATION CONTENT GUIDELINE

## EXAMINATION MODEL

The MLS(ASCP) and MLS(ASCP)<sup>i</sup> certification examination is composed of 100 examination questions given in a 2 hour 30 minute time frame. All examination questions are multiple-choice with one best answer. The MLS(ASCP) and MLS(ASCP)<sup>i</sup> certification examination is administered using the format of computer adaptive testing (CAT).

With CAT, when a person answers a question correctly, the next test question has a slightly higher level of difficulty. The difficulty level of the questions presented to the examinee continues to increase until a question is answered incorrectly. Then a slightly easier question is presented. In this way, the test is tailored to the individual's ability level.

Each question in the test bank is calibrated for level of difficulty and is assigned a content area that matches with the subtest area of the content outline for a particular examination. The weight (value) given to each question is determined by the level of difficulty. Therefore, the examinee must answer enough difficult questions to achieve a score above the pass point in order to successfully pass the certification examination.

## EXAMINATION SUBTESTS

The MLS(ASCP) and MLS(ASCP)<sup>i</sup> certification examination questions encompass different subtests within the area of Medical Laboratory Science: Blood Banking, Urinalysis and Other Body Fluids, Chemistry, Hematology, Immunology, Microbiology, and Laboratory Operations. Each of these subtests comprises a specific percentage of the overall 100-question certification examination. The subtests for the MLS examination are described in the following table:

SUBTESTS	DESCRIPTION	EXAM PERCENTAGES
<b>BLOOD BANK (BBNK)</b>	Blood Group Systems, Antibody Screen & Identification, Crossmatch, DAT, Elution/Adsorption, Blood Donation, Transfusion Therapy, Transfusion Reactions, HDFN, Phenotyping/Genotyping, Antibody Titer, Pre-warm Technique	<b>17-22%</b>
<b>URINALYSIS AND OTHER BODY FLUIDS (UA)</b>	Physical, Chemical & Microscopic Urinalysis and Body Fluid Analysis (CSF, Amniotic, Synovial, Serous, Semen & Feces)	<b>5 – 10%</b>
<b>CHEMISTRY (CHEM)</b>	Carbohydrates, Acid Base, Electrolytes, Proteins & Other Nitrogen-Containing Compounds, Enzymes, Heme Derivatives, Lipids & Lipoproteins, Endocrinology, Tumor Markers, TDM, Toxicology	<b>17 – 22%</b>
<b>HEMATOLOGY (HEMA)</b>	Erythrocytes & Leukocytes, Reticulocyte Count, ESR, Sickle Cell Test, Hemoglobin Electrophoresis, RBC Enzymes, RBC/WBC Morphology & Differentials, Platelets, Hemostasis	<b>17 – 22%</b>
<b>IMMUNOLOGY (IMMU)</b>	Autoimmunity, Immune Responses, Physiology of the Immune System, Immunology of Viral & Microbial Infectious Diseases	<b>5 – 10%</b>
<b>MICROBIOLOGY (MICR)</b>	General Microbiology, Aerobic Gram-positive Cocci, Gram-negative Bacilli, Gram-negative Cocci, Gram-positive Bacilli, Anaerobes, Fungus, Viruses, Mycobacteria, Parasites	<b>17 – 22%</b>
<b>LABORATORY OPERATIONS (LO)</b>	Quality Assessment/Troubleshooting, Safety, Management, Laboratory Mathematics, Instrumentation, Molecular Techniques, Education & Communication, Laboratory Information Systems	<b>5 – 10%</b>

For a more specific overview of the subtest areas on the MLS(ASCP) and MLS(ASCP)<sup>i</sup> certification examination, please refer to the **CONTENT OUTLINE** on pages 2 – 4.

# MEDICAL LABORATORY SCIENTIST, MLS(ASCP) INTERNATIONAL MEDICAL LABORATORY SCIENTIST, MLS(ASCP)<sup>i</sup> EXAMINATION CONTENT OUTLINE

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**IMPORTANT:** Examination questions, which are related to the subtest areas outlined below, may be both theoretical and procedural. Theoretical questions measure skills necessary to apply knowledge, calculate results, and correlate patient results to disease states. Procedural questions measure skills necessary to perform laboratory techniques, evaluate laboratory data, and follow quality assurance protocols

## I. BLOOD BANK (17 – 22% of total exam)

### 1. Blood Group Systems

- A. Genetics
  - 1) Basic
  - 2) Molecular
  - 3) Inheritance of blood groups
  - 4) Applied
  - 5) Parentage
- B. Chemistry, Antigens
  - 1) ABO
  - 2) Lewis
  - 3) Rh
  - 4) MNS
  - 5) P, Globoside
  - 6) *i*
  - 7) Kell
  - 8) Kidd
  - 9) Duffy
  - 10) Lutheran
  - 11) Other
  - 12) Antigens of high incidence
  - 13) Antigens of low incidence
  - 14) HLA
  - 15) Platelet specific
  - 16) Granulocyte specific
- C. Role of Blood Groups in Transfusion
  - 1) Immunogenicity
  - 2) Antigen frequency

### 2. Antibody Screen and Identification

- A. Antibody Screen
- B. Antibody Identification
  - 1) Duffy
  - 2) *i*
  - 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/adsorption
  - 4) Antibody titer
  - 5) Pre-warm technique
  - 6) Rosette and Kleihauer-Betke

### 4. Blood Donation, Transfusion Therapy, Transfusion Reactions and Hemolytic Disease of the Fetus and Newborn (HDFN)

- A. Blood Donation
  - 1) Donor requirements
  - 2) Donor testing
- B. Transfusion Therapy
  - 1) RBC
  - 2) PLT
  - 3) FFP
  - 4) Cryoprecipitated AHF
  - 5) RhIG
- C. Transfusion Reactions
- D. HDFN

## II. URINALYSIS & OTHER BODY FLUIDS (5 – 10% of total exam)

### 1. Urinalysis

- A. Physical
  - 1) Color and clarity
  - 2) Specific gravity/osmolality
- B. Chemical
  - 1) Reagent strip
  - 2) Confirmatory tests
- C. Microscopic

- 1) Cells
- 2) Casts
- 3) Crystals
- 4) Contaminants
- 5) Artifacts/microorganisms

D. Physiology

**2. Other Body Fluids (Qualitative & Quantitative)**

- A. CSF
- B. Amniotic, Synovial, Serous, Semen and Feces

**III. CHEMISTRY (17 – 22% of total exam)**

**1. Carbohydrates, Acid Base and Electrolytes**

- A. Carbohydrates
  - 1) Glucose
  - 2) Glycated hemoglobin
  - 3) Other carbohydrates (e.g. lactate)
- B. Acid Base
  - 1) pH, pCO<sub>2</sub>, pO<sub>2</sub>
  - 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 (e.g., BNP)
- B. Heme Derivatives
  - 1) Hemoglobin (S, fetal, A<sub>2</sub>, 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
  - 4) ALP

- 5) GGT
- 6) Other

B. Lipids and Lipoproteins

- 1) Cholesterol (total, HDL, LDL)
- 2) Triglycerides
- 3) Phospholipids (PG)
- 4) Other lipids and lipoproteins

**4. Special Chemistry (Endocrinology, Tumor Markers, TDM, Toxicology)**

- A. Endocrinology and Tumor Markers
  - 1) T<sub>3</sub>, T<sub>4</sub>, TBG, TSH
  - 2) hCG, FSH, LH, estradiol
  - 3) Other hormones (e.g. cortisol)
  - 4) Tumor markers (e.g., alpha fetoprotein, CEA, hCG, PSA)
- B. TDM and Toxicology
  - 1) Therapeutic drug monitoring
  - 2) Drugs of abuse
  - 3) Other toxicology (e.g., carbon monoxide)

**IV. HEMATOLOGY (17 – 22% of total exam)**

**1. Erythrocytes and Leukocytes**

- A. Red Blood Cells and Indices
  - 1) RBC count
  - 2) Hemoglobin, hematocrit and indices
- B. White Blood Cells
  - 1) WBC count
  - 2) Cytochemical stains (e.g., esterases, myeloperoxidase, TdT)
- 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
  - 1) Sickle cell tests
  - 2) Hemoglobin electrophoresis
- D. RBC enzymes (e.g. G-6PD)
- E. Other (e.g., immunophenotyping, cytogenetics)

**3. Morphology and Differentials**

- A. Red Blood Cell Morphology
- B. White Blood Cell Morphology
- C. Differential (Whole Blood and Bone Marrow)
- D. Platelet Morphology

#### 4. Platelets and Hemostasis

- A. Platelets
  - 1) Platelet count
  - 2) Platelet function
  - 3) Disease correlation
- B. Hemostasis
  - 1) PT, aPTT, TT
  - 2) Fibrinogen, FDP, D-dimer
  - 3) Factor assays
  - 4) Inhibitor anticoagulants
  - 5) Mixing studies
  - 6) Anticoagulant therapy
  - 7) Hypercoagulability tests
  - 8) Disease correlation

### V. IMMUNOLOGY (5 – 10% of total exam)

#### 1. Immunity

- A. Autoimmunity
  - 1) ANA, anti-DNA
  - 2) CRP/RF
  - 3) Thyroid antibodies
  - 4) Other
- B. Immune Responses
- C. Physiology of the Immune System

#### 2. Infectious Diseases

- A. Viral
  - 1) EBV/infectious mononucleosis
  - 2) Hepatitis
  - 3) HIV/HTLV/CMV
  - 4) Rubella/measles
  - 5) Other viruses
- B. Microbial
  - 1) Syphilis
  - 2) Other microorganisms

### VI. MICROBIOLOGY (17 – 22% of total exam)\*

Includes biochemical, immunologic, serologic, and other molecular methodologies (e.g. MALDI-TOF) required for identification and detection of microorganisms and antimicrobial susceptibility testing

#### 1. Aerobic Gram-positive Cocci

- A. Aerobic Gram-positive Cocci:  
*Staphylococcus, Streptococcus, Enterococcus*, other (e.g., *Gemella, Leuconostoc, Micrococcus, Aerococcus*)

#### 2. Gram-negative Bacilli

- A. *Enterobacteriaceae* (e.g., *Citrobacter, Escherichia, Enterobacter, Klebsiella, Morganella, Proteus, Providencia, Salmonella, Serratia, Shigella, Yersinia*)
- B. Other Gram-negative Bacilli (e.g., *Acinetobacter, Aeromonas, Bordetella, Brucella, Campylobacter, Eikenella, Francisella, Haemophilus, Helicobacter, Legionella, Pasteurella, Plesiomonas, Pseudomonas, Burkholderia, Stenotrophomonas, Chryseobacterium, Vibrio, HACEK, Bartonella, Capnocytophaga*)

#### 3. Gram-negative Cocci, Gram-positive Bacilli and Anaerobes

- A. Aerobic Gram-negative Cocci (e.g., *Neisseria, Moraxella*)
- B. Aerobic or Facultative Gram-positive Bacilli (e.g., *Bacillus, Corynebacterium, Erysipelothrix, Gardnerella, Lactobacillus, Listeria, Nocardia, Streptomyces*)
- C. Anaerobes
  - 1) Gram-positive (e.g., *Bifidobacterium, Clostridium, Eubacterium, Actinomyces, Peptostreptococcus, Propionibacterium*)
  - 2) Gram-negative (e.g., *Bacteroides, Fusobacterium, Porphyromonas, Prevotella, Veillonella*)

#### 4. Fungus, Viruses, Mycobacteria and Parasites

- A. Fungi
  - 1) Yeast (e.g., *Candida, Cryptococcus, Geotrichum, Malassezia*)
  - 2) Dimorphic fungi (e.g., *Blastomyces, Coccidioides, Histoplasma, Sporothrix*)
  - 3) Dermatophytes (e.g., *Epidermophyton, Microsporium, Trichophyton*)
  - 4) Zygomycetes (e.g., *Absidia, Mucor, Rhizopus*)
  - 5) Opportunistic molds/septate hyaline molds (e.g., *Aspergillus, Penicillium*)
  - 6) Dematiaceous molds
  - 7) *Pneumocystis*
- B. Mycobacteria
  - 1) *Mycobacterium tuberculosis* complex (e.g., *M. tuberculosis*)
  - 2) Other Mycobacteria (e.g., *M. avium-intracellulare*, rapid growers, *M. goodii, M. kansasii, M. leprae, M. marinum, M. scrofulaceum*)

- C. Viruses and Other Microorganisms
  - 1) Viruses (e.g., specimen collection/transport/processing, cell culture, rapid antigen detection)
  - 2) Other microorganisms (e.g., *Chlamydia*, *Mycoplasma*)
- D. Parasites
  - 1) Blood and tissue protozoa (e.g., *Plasmodium*, *Trypanosoma*)
  - 2) Intestinal and urogenital protozoa (e.g., *Cryptosporidium*, *Entamoeba*, *Giardia*, *Trichomonas*)
  - 3) Intestinal and tissue helminths (e.g., *Ascaris*, *Enterobius*, hookworm, *Schistosoma*, *Strongyloides*, *Taenia*, *Trichinella*, *Trichuris*)

## VII. LABORATORY OPERATIONS (5 – 10% of total exam)

- 1. **Quality Assessment/Troubleshooting**
  - A. Pre-Analytical, Analytical, Post-Analytical
  - B. Quality Control
  - C. Compliance
  - D. Regulation
- 2. **Safety**
- 3. **Management**
  - A. Purchasing
  - B. Inventory Control
  - C. Competency
- 4. **Laboratory Mathematics**
- 5. **Instrumentation**
- 6. **Education and Communication**
- 7. **Laboratory Information Systems**
- 8. **Molecular Techniques**

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

**END OF CONTENT GUIDELINE**