

TECHNOLOGIST IN MOLECULAR BIOLOGY, MB(ASCP) EXAMINATION CONTENT GUIDELINE

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 technologist, the Certification Levels Definitions refer to skills and abilities expected at career entry, not those that may be acquired with subsequent experience.

TECHNOLOGIST LEVEL

Knowledge

The technologist has an understanding of the underlying scientific principles of laboratory testing as well as the technical, procedural, and problem-solving aspects. The technologist has a general comprehension of the many factors which affect health and disease, and recognizes the importance of proper test selection, the numerous causes of discrepant test results (patient and laboratory), deviations of test results, and ethics including result confidentiality. The technologist correlates abnormal laboratory data with pathologic states, determines validity of test results, and need for additional tests. The technologist understands and enforces safety regulations, uses statistical methods and applies business and economic data in decision making. The technologist has an appreciation of the roles and interrelationships of paramedical and other health related fields and follows the ethical code of conduct for the profession.

Technical Skills

- *Performs full range of molecular laboratory procedures.*
- *Participates in the evaluation of new techniques and procedures in the laboratory.*

The technologist is capable of performing and interpreting standard, complex, and specialized tests. The technologist has an understanding of quality assurance sufficient to implement and monitor quality control programs. The technologist is able to participate in the introduction, investigation and implementation of new procedures and in the evaluation of new instruments. The technologist evaluates computer-generated data and troubleshoots problems.

The technologist understands and uses troubleshooting, validation, statistical, computer, and preventative maintenance techniques to insure proper laboratory operation.

Problem Solving and Analytical Decision Making

- *Evaluates and solves problems related to collection and processing of biological specimens for analysis.*
- *Differentiates and resolves technical, instrument, physiologic causes of problems or unexpected test results.*

The technologist has the ability to exercise initiative and independent judgment in dealing with the broad scope of procedural and technical problems. The technologist is able to participate in, and may be delegated, the responsibility for decisions involving: quality control/quality assurance programs, instrument and methodology selection, preventive maintenance, safety procedures, reagent purchases, test selection/utilization, research procedures, and computer/statistical data.

Communication

- *Provides administrative and technical consulting services on laboratory testing.*

The technologist communicates technical information such as answering inquiries regarding test results, methodology, test specificity and sensitivity and specific factors that can influence test results to other health professionals and consumers. The technologist develops acceptable criteria, laboratory manuals, reports, guidelines, and research protocols.

Teaching and Training Responsibilities

- *Incorporates principles of educational methodology in the instruction of laboratory personnel, other health care professionals and consumers.*

The technologist provides instruction in theory, technical skills, safety protocols, and application of laboratory test procedures. The technologist provides continuing education for laboratory personnel and maintains technical competence. The technologist may participate in the evaluation of the effectiveness of educational programs.

Supervision and Management

- *Gives direction and guidance to technical and support personnel.*

The technologist has an understanding of management theory, economic impact and management functions. The technologist participates in and takes responsibility for establishing technical and administrative procedures, quality control/quality assurance, standards of practice, safety and waste management procedures, information management and cost effective measures. The technologist supervises laboratory personnel.

THE EXAMINATION MODEL

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

COMPETENCY STATEMENTS describe the entry level skills and tasks performed and measured on the examination.

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 has been administered and scored, a report is sent to the examinee. 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. This information may help the examinee identify areas of strengths and weaknesses in order to develop a study plan for future examinations. A total score of 400 is required to pass the examination. The subtest percentages for the MB examination is listed below:

SUBTESTS	MB
Molecular Science	25-30%
Molecular Techniques	35-40%
Laboratory Operations	15-20%
Applications of Molecular Testing	15-20%

COMPETENCY STATEMENTS

TECHNOLOGIST IN MOLECULAR BIOLOGY

In regards to Laboratory Operations and the performance of laboratory tests involving Molecular Techniques, the Technologist in Molecular Biology:

APPLIES KNOWLEDGE OF

- basic and special laboratory procedures
- sources of error
- fundamental characteristics of molecular theory/molecular biology
- theories and practice related to laboratory operations
- standard operating procedures
- fundamental theories of genetics

SELECTS APPROPRIATE

- course of action for method and test requested
- methods, instruments, reagents and controls
- routine and special laboratory procedures to verify tests results

PREPARES APPROPRIATE INSTRUMENTS, REAGENTS AND CONTROLS

CALCULATES RESULTS

ASSESSES TEST RESULTS BY CORRELATING LABORATORY DATA WITH

- clinical data
- quality control data
- physiologic processes to validate results and procedures

EVALUATES LABORATORY DATA TO

- recognize health and disease states
- make identifications
- verify test results for reporting
- resolve possible inconsistent results/sources or error
- check for procedural/technical problems
- determine appropriate instrument adjustments
- take corrective action
- assess test for procedural validity/accuracy
- recognize and report abnormal test results and/or the need for additional testing
- determine alternate test methods
- establish laboratory operational/testing procedures
- establish reference range criteria
- establish new testing procedures for alternate methods
- assure personnel safety

CONTENT OUTLINE

TECHNOLOGIST IN MOLECULAR BIOLOGY

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

I. MOLECULAR SCIENCE (25-30%)

A. Nucleic Acid Chemistry

1. Sugars
2. Bases
3. Chemical structure
4. Associated proteins
5. Mutations

B. Basic Molecular Theory

1. Replication
2. Transcription
3. Exons, introns, and splicing
4. Translation
5. Chromosome structure

C. Biochemical Reagents

1. Polymerase enzymes
 - a. DNA
 - b. RNA
2. Endo and exonuclease enzymes
3. Reverse transcriptase
4. DNA ligase
5. Assay development and design

D. Genetics

1. Human
2. Microbial

II. MOLECULAR TECHNIQUES (35-40%)

A. Separation and Detection

1. Electrophoresis
 - a. Gel
 - b. Capillary
2. Blotting and probing procedures
3. Probe hybridization
4. In-situ hybridization
5. Nucleic acid purification

B. Nucleic Acid Amplification

1. Polymerase chain reaction (PCR)
2. PCR variations (e.g., real-time, nested, multiplex)
3. Branched DNA (bDNA) technology
4. Sequence based (NASBA)
5. Transcription-mediated technology (TMA)
6. Strand displacement amplification (SDA)
7. Other (e.g., hybrid capture, ligase chain reaction, cleavase invader)

C. DNA Sequence Analysis

1. Chain terminators
2. Manual gel sequencing
3. Automated sequence analyzer
4. Restriction fragment length polymorphism (RFLP)
5. Other (e.g., pyrosequencing)

D. Other Techniques

1. Denaturing gradient gel
2. Denaturing HPLC
3. Heteroduplex and single strand conformation analysis
4. Melting curves analysis

III. LABORATORY OPERATIONS (15-20%)

A. Laboratory Design

B. PCR Product Contamination

1. Prevention
2. Monitoring and detection
3. Elimination

C. Quality Assurance

1. Specimen collection, preparation, and storage
2. Reagent selection, preparation, storage, and disposal
3. Assay selection, validation, documentation, result interpretation, and calculation
4. Quality control and proficiency testing

D. Guidelines and Regulations

1. Analyte specific reagent (ASR) and CPT coding
2. CLIA, JCAHO, CAP, CLSI, FDA

E. Personnel

1. Continuing education
2. Competency

F. Safety

IV. APPLICATIONS OF MOLECULAR TESTING (15-20%)

A. Infectious Disease

B. Hematology/Oncology

C. Genetics

D. Other

1. Histocompatibility
2. Genetic identity (paternity, forensic, and engraftment)
3. Pharmacogenomics

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

You will need to bring a non-programmable calculator with log function to the examination.

END OF CONTENT GUIDELINE