Laboratory Leadership Competency Toolkit

A Practical Guide to Board Examination and Laboratory Leadership Resources

APHL ASSOCIATION OF PUBLIC HEALTH LABORATORIES®

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Contents

Background

Public Health Laboratories (PHLs) across the nation have evolved dramatically over the past few decades regarding laboratory services and response activities required to protect public health. While protecting the public is core to the mission of PHLs, it is important to emphasize that specific testing services and state programs supported by the laboratory may vary from state to state. PHLs may offer testing services in a few program areas or many areas, depending on size, scope and funding capacity. Standard laboratory testing services include clinical diagnostics, food, newborn screening and childhood disorders, toxicology, environmental protection, drinking water, agriculture and consumer services, and emergency response to support surveillance and outbreak investigations.

A Public Health Laboratory Director (PHLD) must understand a diverse spectrum of state and federal program areas and be knowledgeable of testing that may encompass multiple scientific disciplines, including microbiology, immunology, clinical chemistry, radiochemistry or molecular diagnostics. Additionally, the duties and responsibilities of PHLDs often require knowledge in non-testing areas, such as laboratory and facility operations, personnel management, workforce training, budgeting, accreditation, state and federal laws, laboratory safety and security. Currently, few specialized academic fellowship or training programs fully prepare potential PHLDs to not only obtain required board certification to direct high complexity clinical laboratory testing but also to ensure a solid foundation and understanding of the other administrative duties that are critical to successful laboratory operations.

This guide provides:

- A curriculum framework for potential PHLDs and/or individuals directing high complexity laboratory testing to further assist with career development
- Key core competencies required for PHLDs or laboratory leaders, with an understanding that specific competencies are site dependent
- Board certification requirements for PHLDs or individuals directing high-complexity clinical testing, as required by Clinical Laboratory Improvement Amendments of 1988 (CLIA'88 ,42CFR493)
- Resources to help individuals review core curriculum materials for board certification examinations

Laboratory Director Responsibilities

Primary Duties and Responsibilities

Laboratory directors must be able to:

- Understand the core duties and responsibilities and the level of oversight (direct versus delegated) required for these duties as established by various accreditation agencies and regulations (e.g., CLIA, CAP, ISO17025, etc.)
- Possess a comprehensive understanding of the laboratory's quality system including policies, procedures and processes
- Ensure the appropriateness of the laboratory's critical/panic values based on the patient population served
- Knowledge and compliance with CLIA notification requirements, such as a change in laboratory director

- Establish protocols for ongoing review and evaluation of the laboratory's quality assessment plan, monitoring critical indicators, documenting non-conforming events, and implementing corrective and preventive actions (CAPAs)
- Ensure review of all laboratory proficiency test (PT) enrollments, including:
    - PT testing requirements and consequences regarding PT testing referral or consultation
    - Performance reports
    - Use of CAPAs following unsuccessful or unsatisfactory PT performance
- Be knowledgeable of the testing equipment and test systems used by the laboratory, including:
    - Established quality control (QC) parameters
    - Validation and verification criteria for test methods
    - Applicability of testing performed for different patient populations
- Ensure a sufficient number of supervisory and testing personnel within the laboratory that possess the required education and experience for the designated roles to include adequate training and document competency assessment records

Additional Responsibilities

Additional responsibilities include ensuring:

- Adequate physical and environmental laboratory facilities and conditions
- Laboratory environmental safety for all employees, including:
    - Physical, chemical and biological hazards
    - Compliance with safety and biohazard requirements
- Day-to-day supervision for all testing personnel
- Availability of competent personnel to review test results and reports
- Availability of on-site supervision for minimally qualified testing personnel performing high-complexity laboratory testing
- Review all testing procedures and laboratory policies and ensure ongoing review and approval
- All laboratory testing personnel follow laboratory protocols and polices, and competency is documented and reviewed
- Laboratory testing responsibilities and duties for all personnel are documented in writing
- Appropriate test selection and interpretations of test results are present on laboratory reports
- Customers and patients have access to consultation regarding test results
- All test methods are properly validated/verified (accuracy/precision) and test results are not reported when the system is not functioning properly
- A quality assessment and management program is established and maintained for all phases of testing (pre-analytical, analytical and post-analytical), including establishment of acceptable analytical test performance criteria
- A CAPA process is developed and utilized to document procedural drifts/deviations and non-conformances
- Access for all laboratory and/or testing personnel to an orientation and training program
- Completion of annual performance evaluations and competency documentation for testing staff
- Opportunities for training and continuing education for personnel
- The laboratory is customer-focused

Core Competencies and Learning Benchmarks

For over a decade, 15 core competencies have guided how we classify the knowledge, skills and abilities necessary for PHL professionals to deliver efficient and effective core laboratory services. Competency Guidelines for Public Health Laboratory Professionals* was the product of a two-year collaboration, sponsored by the US Centers for Disease Control and Prevention (CDC) and the Association of Public Health Laboratories (APHL), and summarized input from experts representing state and local PHLs, clinical laboratories, academia and other laboratory professional organizations.

The competency guidelines were developed for leadership professionals, including governmental public health, environmental and agricultural laboratories which provide testing for biological, environmental, radiological and/or chemical hazards, foodborne and waterborne diseases, metabolic and hereditary disorders, and natural and human-made public health emergencies. These competency areas have been adopted as the guiding framework for this *Practical Guide*. The specifics of what laboratory directors should know or be able to do within these areas are explored in this section.

While the 15 core competencies encompass many areas within public health infrastructure, the specific competencies required to direct one PHL may differ significantly from another, as they can vary in volume and scope of testing.

These competencies also apply to non-PHL professionals working in other laboratory and non-laboratory settings. Although the required list of competencies may seem daunting for individuals considering a career as a PHLD, it should be emphasized that there are many individuals within a PHL that share the duties and responsibilities required for many of these competencies and these individuals provide critical expertise and consultation to laboratory directors.

Core Competencies for Public Health Laboratory Directors

1. Quality Management Systems
2. Ethics
3. Management and Leadership
4. Communication
5. Security
6. Emergency Management and Response
7. Workforce Training
8. General Laboratory Practice
9. Safety
10. Surveillance
11. Informatics
12. Microbiology
13. Chemistry
14. Bioinformatics and Data Modernization Concepts
15. Research
16. Additional Competency Areas

* Ned-Sykes et al., MMWR 64(01); 1-81. Available from: www.cdc.gov/mmwr/preview/ind2015_su.html

1. Quality Management Systems

- All phases: pre-analytical, analytical and post-analytical
- Laboratory accreditation, certification and inspection requirements
- CLIA Regulations:
    - Different types of CLIA laboratory certifications and testing complexity categorizations, including Waived, Provider Performed Microscopy, Moderate Complexity and High Complexity
    - Specific educational and experience qualifications for all levels of staffing (e.g., testing personnel to director) directing moderate vs high complexity
    - Specific duties and responsibilities of all levels of staffing
    - Requirements for critical staffing for technical consultation, on-site supervision for the type of testing performed
- Data reporting requirements:
    - Test interpretations and consultation requirements
    - Requirments for referral reporting and panic/critical values
    - Required information on laboratory test reports
    - Record retention requirements
- Validation, performance verification of test methods and instrumentation:
    - Terms, definitions and calculations and the ability to calculate if given data
    - Control monitoring:
        - Westgard Rules, including definitions and possible causes for exceeding standard deviation limits when using the Levey-Jennings chart
        - Potential causes for warning and out-of-control trending data (e.g., shift, drift, dispersion, etc.)
    - Test performance criteria:
        - Sensitivity versus specificity
        - Standard deviation
        - Coefficient of variance
        - P-values
        - Positive Predictive Value (PPV)/Negative Predictive Value (NPV)
        - Precision versus accuracy
        - Mean, median, mode
        - Limits of detection
    - Regulations and criteria required by the US Food and Drug Administration (FDA):
        - FDA-approved versus non-FDA approved testing
        - Laboratory developed tests (LDTs)
        - Emergency use authorization
    - PT:
        - Requirements for enrollment and frequency
        - Requirements for completing testing and reporting
        - Ethical expectations
        - Acceptable actions following a failed PT
- CAPAs:
    - What is considered a non-conforming event
    - Requirements for initiation of CA versus PA
    - How to conduct a root cause investigation
    - Corrective actions versus corrections
    - Monitoring for reestablishment of conformance
- Standard operating procedures (SOPs):
    - How to write SOPs
    - Required sections for a technical SOP
    - Review requirements for SOPs
    - Controlled versus uncontrolled documents
    - Individualized Quality Control Plan (IQCP) requirements and when necessary
    - Safety requirements

2. Ethics

- Expectations for staff
- Required policies, procedures and training for laboratory staff
- State and federal laws regarding ethics, data integrity and confidentiality
- Whistleblower protections
- Rules and regulations relating to protected health information
- Stewardship of resources
- Health Insurance Portability and Accountability Act (HIPAA) regulations:
    - Purpose and what is covered by the Act
    - Privacy and Security Rule
    - Examples of HIPAA violations
    - Category, types and associated fines for violations
- Freedom of Information Act (FOIA) vs Subpoena
- Guiding principles regarding ethical conduct in research
- Informed consent and Institutional Review Board (IRB) requirements

3. Management and Leadership

- Personnel and human resource management:
    - Staffing levels and position descriptions to include required knowledge, skills and abilities (KSAs)
    - Interviewing process and recruitment
    - Staff performance planning and evaluations
    - Progressive disciplinary process
    - Short-term versus long-term disability regulations
    - Termination process
- Personnel education, training and competency requirements:
    - Orientation and training requirements including immunizations
    - Training and education verifications
    - Education, training and experience required for staff to meet accreditation requirements
    - Written testing responsibilities
    - Competency assessments and review requirements
- Federal and state employment laws (e.g., Civil Rights Act, Fair Labor Standards Act, Equal Employment Opportunity, American Disability Act, etc.):
    - Employer qualifications under each posting requirements ***(Note: Prepare for situational-based questions)***
    - Employment laws and number of employees within the organization
    - Federal law compliance
    - US Department of Transportation (DOT), Drug Enforcement Agency, Federal Select Agent Program, Occupational Safety and Health Administration (OSHA), CLIA, etc.
    - State and local law compliance
- Record and specimen use and retention requirements:
    - Safety, QA, vaccinations, incident reports, etc.
    - Legal records
    - Chain of custody samples/records
    - IRB requirements for research versus diagnostic testing
    - Common Rule regarding use of residual specimens
- Fiscal management and budgeting:
    - Types of laboratory budgets (e.g., zero-base budget, appropriation budget, internal service fund budget, etc.)
    - Understanding of each budget type
    - Cost analysis or cost per test calculations
    - Why different budget types are used
    - Advantages and disadvantages of each type of budget
    - Knowledge of the types of test costing strategies used by laboratories (e.g., loss leader)
    - Understanding of each type of costing strategy, why/when each is used and advantages/disadvantages of each
- Medicare and Medicaid payments for laboratory tests
- Difference between CPT and ICD-10 codes, SNOMED, LOINC and Code modifiers

4. Communication

- Approaches to build, maintain and enhance the state laboratory system:
  - Collaboration and interaction with hospitals and private commercial laboratories
  - Ongoing communication and interaction with local public health, agriculture and environmental health agencies
  - Foster and enhance partnerships with local, state, and federal public health programs and other partners (e.g., national associations)
- Surveying external customers and other partners for performance feedback including managerial review of feedback
- Surveying laboratory staff for job satisfaction, feedback and suggestions for improvements including managerial review of feedback
- Ensure an environment of diversity, equity, inclusion and acceptability/belonging
- Define appropriate types of dialog and communications with customers, press, legislature and other jurisdictional partners
- Risk communication planning

5. Security

- Facility access and requirements for different testing areas, including time of access (e.g., 24 hours)
- Emergency notification protocols
- Staff access and background investigation requirements
- Protocols for security guards to include after hours and alarm monitoring
- Federal Select Agent Program requirements:
  - Definition of select agents
  - Security requirements for staff, facility, etc.
  - Roles and responsibilities of responsible official (RO), alternate RO, principal investigator and testing personnel
  - Federal Select Agent Program forms, reporting and retention timelines
  - Requirements of Tier-1 and non-Tier-1 laboratories

6. Emergency Management and Response

- After-hours security requirements
- Continuity of Operations Planning (COOP) and annual exercises
- Incident Command Structure (ICS) and required training
- Protocols to handle possible threats to laboratory or personnel (e.g., bomb, active shooter, unauthorized person in building, etc.)
- Surge planning

7. Workforce Training

- Continuing education (CE) and professional development
- Personnel certification requirements, as applicable
- State-specific certifications
- Annual required trainings/drills:
  - Safety
  - Security
  - Ethics
  - Bloodborne pathogens
  - Chemical hygiene and hazardous materials
  - Tornado, fire emergency, earthquake, etc.
- Packing and shipping training

8. General Laboratory Practice

- Laboratory concepts and terminology
- Understanding of different laboratory technologies and instrumentation
- Requirements for preventative maintenance, calibration, etc.
- Turnaround time requirements and notifications
- Regulatory requirements

9. Safety

- Requirements for laboratory facility design—physical and environmental
- Components of a plan/program for:
  - Biosafety
  - Biosecurity
  - Incident response
- Employee safety:
  - Bloodborne pathogen training
  - Occupational health program requirements for laboratory workers
  - Hazardous response for biological, chemical and radiological agents
  - Chemical hygiene plan
  - Safety Data Sheets, safety placards and posted warning requirements
  - Risk assessment process:
    - For novel pathogen use
    - For newly developed procedures
  - Required immunizations and time frames for administration
  - Global Harmonization System (GHS) requirements
  - National Fire Protection Association (NFPA) versus GHS (labels, pictograms, meanings)
  - Containment levels and requirements:
    1. Biological, chemical, radiological
    2. Personal Protective Equipment
    3. Facility controls
    4. Waste disposal (Regulated and non-regulated)
  - International Air Transport Association (IATA) and US Department of Transportation
  - Packaging and Shipping Rules and Regulations
    - Category A
    - Category B
    - Materials of Trade
    - Category A, Risk Group 4
  - Sterilization/disinfection methods
  - Animal research

10. Surveillance

- Appropriate data dissemination
- Policies surrounding public health surveillance activities, notifications and laboratory reporting requirements
- Software and tracking systems available or employed

11. Informatics

- Electronic laboratory test ordering and result reporting (ETOR)
- HIPAA rules and regulations
- Protected health information
- Laboratory information management systems (LIMS)
- Regulations regarding test result reporting and referrals
- Familiarity with Health Information Exchange (HIE)
- Cloud computing-associated issues
- Knowledge of HL7, LOINC and SNOMED codes

12. Microbiology

- Bacteriology, parasitology, mycology, virology, immunology/serology
- Tests used to distinguish the different disease-causing agents within and between types
- Infectious disease epidemiology, including basic statistical calculations and possible associated methods
- Unique or distinguishing features of different disease-causing agents.
- Clinical symptoms associated with disease causing disease-causing agents
- Modes of infection/transmission
- Tests used to distinguish different disease-causing agents (within and between types)
- Biosafety considerations or categorizations of different disease-causing agents
- Infectious agent structures and staining patterns under standard or electron microscopy

- Case studies (e.g., what is the disease-causing agent and how would quality assurance aspects impact testing choices?)
- Emerging pathogens
- Interpretation of antimicrobial susceptibility tests
- Zoonotic diseases of public health significance
- Laboratory technologies:
    - Culture:
        - Primary, selective and differential media—types and for which bacterial disease-causing agents
        - Types of cell lines for specific viral disease-causing agents
        - Growth requirements for fungal disease-causing agents
    - Microscopy (bright field, dark field, fluorescent, polarized light)
    - Immunologic/serologic testing:
        - Direct and Indirect Fluorescent Antibody
        - Slide and tube agglutination
        - Enzyme-linked Immunosorbent Assay (ELISA)
        - Plaque Reduction Neutralization Testing (PRNT)
        - Luminex based assays
    - Molecular techniques (see additional techniques within Molecular Diagnostics):
        - Amplification
        - Sequencing

13. Chemistry

- General laboratory methods:
    - Centrifugation
    - Pipette qualification and verification
    - Dilutions
    - Calculations and statistics
    - How to interpret QC Charts (Levey Jenning)
    - Westgard Rules and what they indicate
- Enzymes
- Protein chemistry and biochemistry; amino acids, albumin
- Non-protein nitrogen (NPN): creatinine, urea nitrogen, ammonia, uric acid
- Acyl carnitine, organic acids analysis
- Carbohydrates: ketones, glucose, glycated proteins
- Acid – Base chemistry; Henderson Hasselbalch; Blood Gas
- Metabolic/respiratory alkalosis/acidosis
- Electrolytes
- Nutrition, minerals and vitamins
- Markers and/or biomarkers of:
    - Acute or chronic inflammation
    - Pregnancy
    - Tumor markers
    - Cardiac function
- Endocrinology
- Hormones (steroid and non-steroid)
- Kidney and liver function analyses
- Urinalysis (including crystal interpretation)
- Lipids (lipoproteins, triglycerides, cholesterol)
- Allergy, acute infection, chronic infection monitors
- Diabetes testing
- Toxicology
- Therapeutic drug monitoring
- Immunoassay tests: ELISA, EIA, FIA, etc.
- Instrumentation:
    - Photometric techniques, Beer's Law, stoichiometry
    - Mass spectrometry
    - Liquid chromatography
    - Radiochemistry
- Serology/immunology:
    - Common markers for infectious diseases and their significance
    - Autoimmune diseases

14. Bioinformatics and Data Modernization Concepts

- Development of new algorithms and statistics, analysis and interpretation of various types of data, and the development and implementation of tools to enable efficient access and management of different types of information:
  - Next generation sequencing (NGS) technologies and data analysis tools
  - Application of different NGS technologies
  - Cloud requirements and restrictions
  - Bioinformatics requirements for whole genome sequencing
  - Technology and resource requirements
  - State and federal programs involved with bioinformatics
- Integrate knowledge of biology and computer science:
  - Domain-specific biology principles
  - Domain-specific computer science principles
- Apply knowledge of statistical methods for analysis of biological data:
  - Statistical analysis
  - Data analysis
  - Data interpretation
  - Data visualization and representation
  - Communication
- Conduct data management, storage and retrieval:
  - Data structures*
  - Data management and security
  - Data storage and retrieval
  - Allocation of computing resources

15. Research

- Procedures for establishing and maintaining research programs:
  - Research objectives and agenda
  - Research funding
  - Funding proposal reviews
  - Research staffing and resource management needs
  - Regulatory requirements*
- Requirements to ensure ethical and responsible conduct of research:
  - Ethical conduct in research*
  - Human and non-human subjects
  - Collaboration
  - Sharing research data
- Integrate scientific and technical knowledge for use as a foundation for research:
  - Literature searches
  - Critique of scientific literature
  - Statistical concepts and tests
  - Study designs
  - Scientific and technical concepts and procedures
  - Emerging trends
- Develop new testing methodology:
  - Pilot testing
  - Method validation* and performance verification*
- Conduct research to address a public health issue or answer a public health question:
  - Research project design
  - Experimental strategy and design
  - Conduct experiments
- Conduct research according to professional standards of data management, analysis and application:
  - Data collection and quality*
  - Data management
  - Data analysis and results interpretation
  - Data summaries
  - Application of research findings to current research

* Term defined in Appendix B of *Competency Guidelines for Public Health Laboratory Professionals*.

- Disseminate research findings:
  - Meeting and conference presentations
  - Manuscript preparation
  - Manuscript peer review process
- Translate research findings to public health practice
- National Institutes of Health (NIH) requirements (e.g., Human Subjects and Clinical Trials)
- Funding and resource management
- Regulatory requirements
- Purpose of IRB (also known as independent ethics committee, ethical review boards or research ethics board)
- Patents
- Statistics
- Policies and procedures relating to publication and peer review of laboratory information
- Appropriateness of university and external agency collaborations

16. Additional Competency Areas

Newborn Screening

- Metabolic and hereditary disorders
- Recommended uniform screening panel (RUSP)
- Confirmatory testing
- Timeliness initiatives
- Cutoff values
- Variant testing and interpretations
- Population prevalence studies

Drugs of Abuse Testing

- Screening and confirmatory testing
- Typical analytes targeted in screening
- Chain of custody

Biomonitoring

- NHANES
- IRB
- Residual specimen protocols and procedures

Molecular Diagnostics

Biochemistry

- Genomic/Genetic DNA
- Nucleic acid types, structure and functions (e.g., Mitochondrial DNA, RNA, messenger RNA)
- Gene regulation
- DNA replication
- Mutation types, mutation effects and examples
- Pathogen DNA, RNA
- Structure and function
- Central dogma
- Chromosome structure, analysis, mitosis, aberrations

Inheritance of Traits and Types

- Autosomal single-gene inheritance
- Autosomal dominant/recessive inheritance
- X-linked recessive/dominant inheritance
- Y-linked inheritance

Applications

- Infectious disease
- Heme-pathology
- Solid tumors
- Mosaicism
- Multifactorial disorders, somatic cell genetic disorders, mitochondrial disorders
- Hematology/oncology
- Identity/human leukocyte antigen
- Pharmacogenomics
- Pre-analytical:
  - Sample preparation
    - Formalin fixation
    - Inhibitors
  - Nucleic acid quantification
- Analytical:
  - Amplification-based
  - Probe hybridization
  - Sequencing
  - Fluorescence *in situ* hybridization (FISH)
  - Arrays

Laboratory Director Board Exams

CLIA-approved Laboratory Director Certification Programs

The qualifications for a laboratory director of high complexity testing [as defined by reference 42 CFR 493.1443(b)(3)(i)] is that the laboratory director must hold an earned doctoral degree* in a chemical, physical, biological or clinical laboratory science from an accredited institution and be certified and continue to be certified by a board approved by the US Department of Health and Human Services (HHS).

As of November 2023, approved boards include:

- **ABB | American Board of Bioanalysis**
- **ABCC | American Board of Clinical Chemistry**
- **ABFT | American Board of Forensic Toxicology**
  Director-level certifications limited to individuals with a doctoral degree with fellow status.
- **ABMGG | American Board of Medical Genetics and Genomics**
  Formerly known as American Board of Medical Genetics.
- **ABMLI | American Board of Medical Laboratory Immunology**
  No longer accepting new exam applicants.
- **ABMM | American Board of Medical Microbiology**
- **ACHI | American College of Histocompatibility and Immunogenetics**
  Formerly known as American Board of Histocompatibility and Immunogenetics (ABHI).
- **NRCC | National Registry of Certified Chemists**
  Director-level certifications limited to individuals with a doctoral degree.
- **DMLI | Diplomate in Medical Laboratory Immunology**
  Exam is via the ASCP Board of Certification.

* It is important to highlight that CLIA personnel qualification and responsibility requirements stated in 42CFR, Part 493, Subpart M specifies that "The laboratory director must hold an earned doctoral degree in a chemical, physical, biological or clinical laboratory science from an accredited institution, AND be certified and continue to be certified by a board approved by HHS" [§.493.1443(b)(3)]. The US Centers for Medicare and Medicaid Services (CMS) further interpreted or clarified the "earned doctoral degree" requirement for a laboratory director, by specifying that "an acceptable doctoral degree is a Doctor of Philosophy (PhD) or Doctor of Science (DSc) [CLIA State Operations Manual – Appendix C – "Survey Procedures and Interpretive Guidelines for Laboratories and Laboratory Services," (Rev. 166, 02-03-17)].

Compliance or acceptability of alternate doctoral degrees including (1) Doctor of Dental Surgery (DDS), (2) Doctor of Veterinary Medicine (DVM) or (3) Doctor of Public Health (DrPH) with respect to fulfilling the CLIA educational requirements for a laboratory director of a high complexity testing laboratory has not been specifically determined. Instead, compliance determinations are at the discretion of each CMS CLIA Surveyor. As of January 2018, CMS and the ABB have declined to officially pre-approve doctoral degrees as acceptable and instead both entities indicate that they will evaluate applicants on a case-by-case basis; ABB prior to the examination and CLIA (CMS) upon their first visit to the laboratory.

Board Examination Comparison Table

Table sections include:

- **About the Exam/Board** (pg. 14)
- **Application Requirements** (pg. 19)
- **Exam Preparation** (pg. 21)
- **Certification Renewal** (pg. 22)

The following tables outlines key aspects of four exams, selected because they do not require test takers to have completed their Board's specific fellowship. For the most up to date information, please refer to the websites for each exam, provided within the table.

About the Exam/Board

Exam Info	ABB	ABMM	NRCC	ABCC
General description / overview	ABB certifies clinical laboratory professionals who meet the education, experience and knowledge of the laboratory field in which certification is granted. ABB is recognized by CLIA as a certifying agency for laboratory directors and clinical consultants with designations established for high-complexity clinical laboratory directors (HCLD) and PHLDs.	ABMM certifies doctoral-level microbiologists to direct medical and public health microbiology laboratories that perform high complexity testing. ABMM certification is recognized by federal and state governmental agencies as meeting the licensure requirements to direct laboratories engaged in the microbiological diagnosis of human disease and is recognized by CLIA and all 12 states that require licensure: California, Florida, Georgia, Hawaii, Louisiana, Montana, Nevada, New York, North Dakota, Rhode Island, Tennessee and West Virginia.	NRCC provides certifications for chemical and industrial hygiene officers, cannabis chemists, clinical chemists, clinical chemistry technologists, environmental analytical technologists, toxicological chemists and toxicological technologists.	ABCC certifies individuals with doctoral degrees in clinical chemistry, toxicological chemistry and other clinical laboratory medicine disciplines. In purpose, function, and organization, the ABCC is analogous to the certifying boards in various medical specialties with the aim to establish standards for those who practice clinical laboratory medicine and to certify as Diplomats for those who qualify as specialists who comply with the requirements of the Board.
Additional information from Board	• Website: www.aab.org/aab/About_ABB.asp • FAQ: www.aab.org/aab/FAQs1.asp	• Website: www.asm.org/index.php/abmm-about • Application and exam information, including FAQ: asm.org/Articles/CPHMC/ABMM-Apply	• Website: www.nrcc6.org/ • FAQ: nrcc6.org/faq/	• Website: www.abclinchem.org/
Program Contact	• **Address:** American Board of Bioanalysis 906 Olive Street, Suite 1200 Saint Louis, MO 63101 • **Phone:** 314.241.1445 • **Fax:** 314.241.1449 • **Email:** aab@aab.org	• **Address:** American College of Microbiology 1752 N Street, NW Washington, DC 20036 • **Phone:** 202.737.3600 • **Fax:** 202.942.9353 • **Email:** certification@asmusa.org	• **Address:** Russ Phifer, Executive Director National Registry of Certified Chemists 125 Rose Ann Lane West Grove, PA 19390 • **Phone:** 610.322.0657 • **Fax:** 800.858.6273 • **Email:** rphifer@nrcc6.org	• **Address:** Ms. Erin Grady, Education Coordinator American Board of Clinical Chemistry 900 Seventh Street, NW, Suite 400 Washington, DC 20001 • **Phone:** 202.835.8717 • **Fax:** 202.887.5093 • **Emails:** EGrady@aacc.org, ABCCAdministrator@myadlm.org
Summary Overview: Pros and cons	**Pros:** You can test in specific scientific disciplines. ABB offers a PHLD certification which is more geared toward public health-related microbiology questions, as opposed to clinical/hospital laboratory microbiology questions. **Cons** • Pass rate is not high when both General Knowledge (GK) and Scientific Technical Disciplines (TD) exams are taken together; much of the information is very detailed and technical, and requires straight memorization. • Questions aim to challenge the applicant, so many of the available multiple-choice answers require interpretation or choosing the best answer from a selection that may not include the “correct” answer.	**Pros:** Exam is accepted by CLIA as one of the board exams required to be a PHLD. **Cons** • Expensive to apply and register. • Many questions are clinical microbiology related, so it can be difficult at times for someone who has not been in that environment in a long time (or ever) to be able to grasp them easily. • Multiple choice questions for laboratory management situations are not practical.	**Pros** • You find out if you passed or failed the exam right after you complete it. • Exam is accepted by CLIA as one of the board exams required to be a PHLD. • You can have someone from your place of employment (i.e., supervisor or lab director) proctor the exam, which allows you to take the exam at work.	

Exam Info	ABB	ABMM	NRCC	ABCC
Exam frequency	**Twice a year** (typically), in the spring and fall.	**Once** a year, from **June 1–30.**	**Any time;** requires the use of a local proctor to receive and administer the exam.	**Twice a year**; typically in February and July.
Exam locations	Various locations in the US.	Online at testing centers around the country.	Examination can be taken: • In the local or state library or at a formal learning center (e.g., Sylvan); some locations may charge a fee. • At your place of employment; must: have a supervisor or current lab director apply and receive approval as a proctor from NRCC, need a laptop and internet.	Online at various testing centers in the US, Canada and other locations.
Exam costs *As of 2024, costs subject to change.*	**Application Fee** = $380 **Standalone Exam Fees** • General Knowledge (GK) exam = $320 • One Technical Discipline (TD) exam = $320 **Same-day Exam Additions/Combos** • Additional TD exams = $155 each • GK + 1 TD = $475 • GK + 2 TD = $625 ***Note:*** *Applications fees are non-refundable. Examinations canceled within 30 days of examination date will be subject to a $100 cancellation fee.*	**Application Fee** • Members of the American Society for Microbiology (ASM) = $450 • Non-ASM members = $575 **Exam Fee** = $400	**Clinical/Toxicological Chemists Only** • Application Fee: $275 • Exam Fee: $260 • Reexamination Fee: $260 **All Other Certification Programs** • Application Fee: $175 • Examination Fee: $185 • Reexamination Fee: $185 ***Note:*** *Can take the exam up to three times per year for all sections.*	**Application Fee** = $500 **Exam Fees** • Clinical chemistry, toxicology = $200 per part, per attempt • Molecular diagnostics = $400 per attempt
Number of exam questions	**GK exam** = 70 questions **TD exams** = 70 questions each (typically)	200 questions.	Need to answer 150 questions, from a pool of questions.	All questions are in multiple-choice format with one best/correct answer; all choices are A-E. **Clinical Chemistry** • **Part A - Calculations and Problem-solving:** 30 questions. • **Part B - Analytical and Clinical Issues:** 140 questions. **Toxicology** • **Part A - Calculations and Problem-solving:** 30 questions. • **Part B - Analytical, Toxicological and Therapeutic Drug Monitoring Issues:** 130 questions. **Molecular Diagnostics** **Recall and Applied Skills (One Part):** 120 questions.
Exam length	2 hours, per exam	6 hours	3 hours	**Clinical Chemistry: Part A:** 3 hours; **Part B:** 3.5 hours **Toxicology: Part A:** 3 hours; **Part B:** 3 hours **Molecular Diagnostics:** 3 hours
Exam reflects duties a lab director performs	While the exam does reflect information of which a laboratory director should be knowledgeable, many of the TD questions are very detailed and require a more technical understanding than a director realistically needs to know, as in practice there are typically other staff that are knowledgeable of the details (e.g., QA staff, safety officers, HR team).	Some duties are reflected—to a degree. For example; • Much of the exam is clinical microbiology-based, so not as relevant for a PHLD. • Some of the management, QA and infection control questions are pertinent.	No, it is more clinical testing-based.	Yes, the Molecular exam has been revised in recent years to provide a better balance between technical, clinical and administrative aspects of the job duties of a laboratory director.

Exam Info	ABB	ABMM	NRCC	ABCC
Sections/topics covered	**ABB Exam** ABB's examinations include a **GK exam** and **at least one TD exam** in a clinical laboratory discipline or specialty. **General Laboratory Knowledge** • Administration/management • Accreditation • Regulatory laws • Patient test management, reporting • Personnel, employment/HR laws • Lab billing • Facility design/requirements • QA/QC, CLIA • Laboratory Safety • Fiscal/budgeting **TD Exams: Clinical Laboratory Disciplines** • Andrology • Chemistry (including urinalysis, endocrinology and • toxicology) • Diagnostic immunology • Embryology • Hematology (including flow cytometry) • Microbiology (includes bacteriology, parasitology, virology and mycology • Molecular Diagnostics • Public Health Microbiology **BCLD Applicants** Must pass ABB GK exam plus a **minimum of three** of the following clinical laboratory disciplines: • Chemistry • Diagnostic immunology • Hematology • Microbiology or public health microbiology • Molecular diagnostics **HCLD Applicants** Must pass **ABB GK exam** plus **at least one** of the eight TD exam clinical laboratory disciplines listed above. **PHLD Applicants** Must pass **ABB GK exam *AND* public health microbiology**.	Exam measures the applicant's knowledge in the four subject areas considered necessary for the effective practice of medical and public health microbiology: • **Directing laboratory testing functions**: ○ Up-to-date Practices (standards, evolving technologies and EIDs) (32.5%) ○ Test Protocols (development, assessment, and implementation—including evidence-based testing methods) (12%) • **Directing laboratory administrative functions:** ○ Test Menus (population, costs, logistics) (6%) ○ QC (formerly QC and Quality Metrics/Indicators) (6%) ○ Critical Results (identification and communication) (3.5%) ○ Quality management systems (2%) ○ PT Program (1.5%) • **Ensuring safety and security in the laboratory:** ○ Laboratory Safety (general, biosafety, biosecurity) (10.5%) ○ Emergency Response Plans (1%) • **Consulting with other medical and public health microbiology professionals:** ○ Medical Personnel (19.5%) ○ Pharmacists (antimicrobial stewardship, formulary, susceptibility testing, antibiogram, sterility testing) (3%) ○ Infection Preventionists (2.5%)	**Clinical Chemist/Clinical Chemistry Technologist** Covers the theoretical, fundamental, and practical aspects of clinical chemistry including calculations and statistics, immunoassays, separation techniques, etc. **Toxicological Chemist/Toxicological Chemistry Technologist** Covers theoretical, fundamental and practical aspects of toxicology including toxicokinetic theory and calculations, fundamentals of pharmacogenetics, broad knowledge of toxicology testing, etc. **Environmental Analytical Chemist** Covers the theoretical, fundamental, and practical aspects of environmental analytical chemistry including sampling scheme, method of selection, analytical methods, etc. **Industrial Hygiene Chemistry** Covers the theoretical, fundamental, and practical aspects of industrial hygiene chemistry including air sampling methods and devices, maintaining sample integrity, sample preparation, quality assurance, etc. **Laboratory Safety** Covers the theoretical, fundamental, and practical aspects of chemical health and safety including hazard assessment, safe work practices, GLP, etc. **Cannabis Chemistry** Covers the theoretical, fundamental, and practical aspects of cannabis chemistry including cannabis analysis, sample preparation, chain of custody, etc.	**Clinical Chemistry (two exams)** • **Part A: Calculations and Problem-solving** • **Part B: Analytical and Clinical Issues**; exam domains: ○ Clinical chemistry interpretation ○ Clinical case approach ○ Analytical ○ Instrumentations ○ Methodology ○ Statistical analysis ○ QA ○ Regulatory/management ○ Molecular/genetics **Toxicology (two exams)** • **Part A: Calculations and Problem-solving** • **Part B: Analytical, Toxicological and Therapeutic Drug Monitoring Issues**; exam domains: ○ Analytical techniques ○ Physiology ○ Pathophysiology ○ Management **Molecular Diagnostics (one exam)** **Recall and Applied Skills;** exam domains: • Genetics • Molecular Biology • Hematology • Microbiology • Identity/HLA • Pharmacogenetics • Biomarkers • Solid Tumors • Techniques • Management

Exam Info	ABB	ABMM	NRCC	ABCC
Exam scoring criteria	Based on the number of correct questions answered. However, ABB may exclude questions based on the analysis of examinee responses, or if the majority of examinees miss a question.	The certification boards of the American College of Microbiology use a criterion-referenced scoring system. You are not graded on a curve and do not compete against each other. The exam committee may remove some questions that the majority of examinees miss to form a new denominator with the remaining questions.	Multiple choice.	Based on the number of correct questions answered. The exam committee may remove questions that the majority of examinees miss or other problems with the question are revealed.
Passing score	Generally, 70%. Cut score is determined independently for each exam based on the mean +/- 2SE.	Generally, 70%	60% (90 of 150)	This information is not shared outside of the board.
Time to receive exam score	Typically, four to six weeks from the date of your examination. Results are forwarded via email and certified mail.	Scores published September 1.	Immediately after completing exam.	About one month.
Score indicates what questions were missed	No, you are provided with a score indicating the number of questions you answered correctly for each section, but not the specific questions missed.	No, the raw score indicates the number of questions missed, but not the specific questions.	No.	No.
Exam passing rate	ABB does not publish this information, but from information gathered from recent exam takers the pass rate is less than ~40% when GK and TD exams are taken at the same time, higher taken separately.	Passing percentages were: • 2023: 71% • 2022: 55% • 2021: 51% • 2020: 62% • 2019: 65%	N/A	Average cumulative five-year pass rates: **Clinical Chemistry** • **Part A:** 53% • **Part B:** 55% **Toxicology** • **Part A:** 72% • **Part B:** 56% **Molecular Diagnostics:** 31%

Exam Info	ABB	ABMM	NRCC	ABCC
Options for a non-passing exam score	The exam can be retaken two times after receiving a failing score but to avoid additional application fees, the exam must be retaken at least one time within the next two examination administrations or within one year, whichever is longer. After a second failure, you have an additional year (or two examination administrations) to retake. After three failed exams, candidates must wait two years after the date of the last failed examination and begin the certification process again including submission of a new application form and fee. In addition, the Board requires that you provide evidence that you have gained additional education or training in the discipline that you are applying for. Documents, such as transcripts and employment verification letters that are in your old file do not have to be resubmitted. However, any additional education or experience not documented with your original application should be documented with the new application.	Candidates have three chances to pass the exam. After three failing scores, you must wait two years and reapply and may take the exam one last time. An additional failure at that stage you are not eligible for future attempts.	The exam can be retaken two times after receiving a failing score. If an applicant fails on the third attempt, they must wait at least 12 months to reapply.	All parts of the examination must be passed within three years of the first examination to avoid termination of the application and forfeiture of all fees. An individual may reapply for certification only once per specialty. The applicant's reapplication must allow at least one exam sitting to lapse between eligibility periods. If necessary, all or part of the examination may be repeated one time (only) without reapplication during the three-year eligibility period by notifying the ABCC office of such intent at least 45 days prior to any scheduled examination. If unable to successfully complete the examination under the conditions above, the applicant may reapply one additional time. The applicant will be required to sit for all parts of the examination regardless of past performance on any one portion. Applicants may not have more than one ABCC examination application open concurrently. Before being allowed to apply for ABCC examination in Clinical Chemistry, Toxicological Chemistry, or Molecular Diagnostics, an applicant must bring any current application process to a close by obtaining a certificate, failing two iterations of the examination, or by allowing the three-year limit to expire before opening another ABCC examination application in the same or different specialty.

Application Requirements

Requirement	ABB	ABMM	NRCC	ABCC
Application requirements	The application for certification MUST be completed online and include: • **Education information:** institutions attended, locations, dates and degrees obtained. Employment history: institutions, addresses and telephone numbers, positions held and duties performed and dates. • **License or certification:** include Medicare, CLIA, state, etc. • **References**: Names, addresses, and affiliations of two qualified laboratory directors or physician clients. • **CV**: Curriculum vitae (CV), list of scientific publications and awards received. • **Official academic transcripts:** Must be directly forwarded to ABB and contain the institution seal. Degrees from institutions outside the US must be evaluated for equivalency by an agency acceptable to ABB. ABB requires copies of transcript release forms sent to educational institutions.	• Creation of a web assessor account. • Application fee payment. • Official graduate transcripts. • Reference(s) information from laboratory directors qualified to serve as a director of CLIA-certified laboratory.	• Application fee payment. • Completed application. • Photograph or copy of driver's license. • Three reference forms with one from your current or immediate past supervisor. • Academic transcripts.	• Send **transcripts** from undergraduate and graduate institutions and three letters of recommendation to ABCCAdministrator@myadlm.org. • If applicable, applicant must send a **credential evaluation report** if education was obtained at an institution outside the US. • **Submit a CV** through the online application.
Degree requirements	• Meet the qualifications of PHLD or HCLD under the CLIA '88, Subpart M, Section 493.1443. ***OR*** • Hold an earned doctoral degree* from an accredited institution in a chemical, physical, biological or clinical laboratory science as the major subject AND successfully completed 32 semester hours (minimum) in chemistry or the biological sciences acceptable to ABB. * *Individuals with an MD, DO or equivalent degree must be licensed to practice medicine in at least one state in the US.*	Applicant must meet the criteria in one of the following plans: • **Plan I:** Doctoral degree** + three years of experience • **Plan II:** Doctoral degree** + CPEP approved program • **Plan III:** Doctoral degree and complete: ○ An ACGME-accredited fellowship program in Medical Microbiology, ***OR*** ○ A Canadian college of Microbiologists (CCM) Fellowship Training Program, ***OR*** ○ A Royal College of Physicians and Surgeons of Canada three-year medical microbiology/infectious disease or five-year medical microbiology residency. ** *Doctoral degree = PhD in microbiology or equivalent **OR** DrPH, MD, DO, DVM, DDS, DMD if special training and experience is approved by ABMM board.*	Earned doctoral degree with at least the equivalence of 12–24 semester hours or 18-36 quarter hours (total hours depends on certification field) in chemistry and 4–8 semester hours (6–12 quarter hours) of additional natural science courses from an institution acceptable to the Board. ***AND*** Meet minimum years of experience requirements working full-time (or part-time equivalent) in specified chemical field. ***Note:** LRN-C testing qualifies as toxicology experience.*	**Degrees** • Earned doctoral degree in a chemical, physical, biological or clinical laboratory science, ***OR*** • A MD, DO, DPM or DMD degree from an accredited university or college acceptable to the Board. **Experience** Applicants must have completed a minimum of 30 semester hours (or equivalent) of undergraduate and/or graduate courses taken at institutions acceptable to the Board that meet the combined criteria established by each of the ABCC certification disciplines. Prior to admission to examination, applicants must demonstrate five years' full-time (or equivalent part-time) diverse professional experience in the relevant discipline area (clinical chemistry, toxicological chemistry or molecular diagnostics). Experience must be obtained subsequent to conferral of the doctoral degree and in laboratories or institutions with standards acceptable to the Board. Experience may be gained as part of or outside of a formal training program. A laboratory director who is qualified to serve as a director of a CLIA-certified laboratory must attest to the candidate's experience. View exceptions.

Requirement	ABB	ABMM	NRCC	ABCC
Pre-examination requirements	Candidates must have a minimum of four years* of clinical lab training or experience on human specimens within the 10 years immediately prior to the application date or both, including at least two years of experience within the 10 years immediately prior to the application date directing or supervising high complexity testing in a clinical setting. Effective January 1, 2021, Molecular Diagnostics is defined as "testing that involves the manipulation and examination of nucleic acid in a high complexity testing environment" (See General Regulations #21). * *ABB will accept up to two years of alternative experience toward the four-year experience requirement for HCLD certification. An additional two years of clinical supervising or directing experience is still required, in addition to the two years of "alternative" experience (see General Regulations, #18).*	Experience is defined as full-time postdoctoral training or director-level lab experience directly relevant to the practice of medical and PH microbiology and its subspecialties. Experience requires an ongoing relationship with a medical and PH microbiology, reference or other microbiology lab that includes a diagnostic service component, such that the applicant has devoted at least 75% of time to management, medical and administrative activities during the three years of experience. The cumulative training/experience must include percentages of time devoted to each of the listed areas: • **Responsibilities and skills in the medical and public health microbiology laboratory (50–65%).** Examples: Assisting medical and PH microbiology technologists in interpreting the medical significance of lab findings, oversight of QA/QC, technical troubleshooting & problem solving. • **Interaction with healthcare providers (15–30%).** Examples: Consultation with healthcare providers regarding selection and interpretation of medical and PH microbiology tests/results, consultation with local and state PH health officials, Reference lab consultation with clients, participation in hospital/institution committees (infection control, antibiotic subcommittee, etc.) • **Management and administrative skills (10–20%).** Examples: Interacting with institutional and laboratory administration and personnel, performing financial analyses on new test methods or laboratory programs, and assuring/overseeing accreditation, competency, proficiency testing, etc. • **Research (0–25%).** Examples: Development/evaluation of new test methods/techniques/instrumentation, collaboration with medical and PH microbiology/basic research colleagues. • **Teaching (0–25%).** Examples: Didactic lectures and rounds, Resident/fellow/student training. The minimum percentages in each area must be met. Research and teaching experience are not required, but applicants may have up to 25% of their time devoted to them, provided the combination does not exceed 25%. Experience in which more than 25% of time is spent on research, teaching, grant writing or test development does not satisfy the experience requirement. Applicants who will complete the requisite training and experience within 60 days following the exam date are eligible to apply.	**Submit Application** Select the appropriate certification; download and complete the application (including photo and notarization) and submit with the application fee electronically or by mail. **Submit Transcripts, Educational Requirements** Submit academic transcripts to NRCC by mail or electronically. Credits to meet the educational requirements of NRCC obtained outside the US or Canada require transcript review by a NRCC approved evaluation agencies and must be submitted to NRCC. **Review** Completed application files (including transcripts and references) are submitted to a credentials committee for final review and approval prior to scheduling the exam (allow at least two weeks before your exam date).	**Application** Applications must be submitted online in compliance with the instructions and be accompanied by the application fee (half of the fee will be refunded if the applicant is not eligible for examination). Applicants must provide official documentation of degrees awarded, academic transcripts or equivalent documentation of all courses taken and grades and all must be submitted directly to ABCC by the university registrar. For degrees obtained outside the US or Canada, a course-by-course evaluation must be submitted from a credential evaluation agency directly to the ABCC office for education. For post-doctoral training programs, the Program Director must submit a letter describing the nature of the training and attesting to its satisfactory completion by the applicant. Applicants must arrange for three letters of reference to be submitted directly to ABCC. They must be current to the time the application is submitted and attest to familiarity with the applicant's professional expertise, the length of acquaintance and the good character of the applicant insofar as pertinent to the Board. Current ABCC Credential Committee members may not serve as references. Applicant must demonstrate five years' full-time (or equivalent part-time) diverse professional experience in the relevant discipline area (clinical chemistry, toxicological chemistry, or molecular diagnostics). Experience must occur in a clinical laboratory: • Conducting non-waived testing with an active CLIA certificate, ***OR*** • Conducting non-waived testing in a CMS approved CLIA-exempt laboratory ***OR*** • Conducting the equivalent of non-waived testing in a medical laboratory accredited by an ILAC recognized organization to the ISO 15189 standard. Applicants qualifying for the examination through professional experience must include a statement indicating their laboratory's accreditation/certification status (e.g., "Lab XX is accredited/certified by organization YY"). **Completion of the Exam** All parts of the exam must be passed within three years of the first exam. Failure to take/pass the exam within this time will result in termination of the application and forfeiture of all fees.

Requirement	ABB	ABMM	NRCC	ABCC
Advanced registration requirements	**Applications Due:** Applications may be submitted **any time**. **Processing Time:** Applications typically take at least six to eight weeks to process, if all documentation (e.g., transcripts, employment verifications) is received promptly. **Candidate Status Notice:** The Board's decision regarding certification applications should be sent within two months of applying, however if documentation is not received promptly, this can be longer.	**Applications Due:** All applications are due by **April 1**.	**Advanced Registration:** Must give at least **two weeks'** notice.	**Applications Due:** Applicants should apply a minimum of **four months prior** to an anticipated examination date. The Board takes no action on incomplete applications (e.g., lacking a transcript or letter of recommendation). **Candidate Status Notice:** When the Board or its committees are satisfied that the requirements for admission for examination have been met, the applicant is designated as a Candidate for examination and will be notified **at least 45 days prior** to an assigned examination date.

Exam Preparation

Preparation	ABB	ABMM	NRCC	ABCC
Is it necessary to study if you have been working in a PHL?	YES!	YES!	YES!	YES!
Preparation/ studying timeline	Typically, six months to a year, with two to three hours dedicated to studying each day. Total time will depend on whether the GK exam is taken concurrently with the TD exam.	Six months to one year, depending on how much time is committed to studying.	Depends on previous scientific and laboratory knowledge.	Very much candidate specific. If a candidate has been working in a specific field, say cancer genetics, and is anticipating sitting for the Molecular Diagnostics exam, time should be devoted to reviewing resources that cover domains of the exam that the candidate is less familiar with, say Microbiology, Identity/HLA, PGx and Lab Management.
Level of detail of exam questions	Many questions are very detailed, while others are general knowledge and can be answered from practical experience. There are highly specific and detailed questions, more than you would expect to have to commit to memory as a laboratory director.	Very detailed. Many questions are vignettes of clinical cases that require you to know the offending organism, then figure out what step to take next. Bacteriology, virology, parasitology, mycology, infection control, quality assurance and laboratory management are all topics on the exam.	The exam questions are straight forward multiple-choice type questions.	Some questions are detailed and require the candidate to perform calculations and problem solving, while many questions are recall of facts.
Best way to prepare for the exam	**Resources:** The ABB study guides are a great resource, but need to be supplemented with other reference materials. Many folks recommend the use of flashcards for memorization of specific details or study groups. Participation in a formal study course is also beneficial, if possible. **Study Practices:** Study daily and consistently—even for an hour—and have an extensive review the week of the exam.	There is no study guide available, so you must assemble a group of materials yourself. Pathology Question of the Day (online) is a great way to prepare, as the questions are very similar.	NRCC Training & Study Resources for Exams website. Additional resources helpful in certain areas: • American Association of Clinical Chemistry Clinical Toxicology certificate course. • *Environmental Chemical Analysis*, Second Edition (2019), by Somentha Mitra, Pradyot Patnaik, Barbara B. Kebbekus.	

Certification Renewal

Renewal Requirement	ABB	ABMM	NRCC	ABCC
Renewal / Recertification Fees and Frequency *As of 2024, costs subject to change.*	To maintain your certification, **you MUST renew your ABOR Certification annually.** Dues are **$102 per year** and include free membership in the Associate Member Section of AAB, a leading association for laboratorians and the laboratory industry.	The ABMM requires its certified individuals, Diplomats, to recertify **every three years.** **Recertification Fees** • **ASM contributing and premium members:** $300, per specialty • **ASM supporting and non-members:** $350 **Recertification Application** • Diplomats must complete an application form to recertify, **due January 31.** • Applications not postmarked by January 31 incur a late fee of: ○ **ASM contributing and premium members:** $300 ○ **ASM supporting and non-members:** $350	**Clinical Chemist/Toxicological Chemist Only** • $120 for one year. • $335 for three years. **All Other Certification Programs** • $95 for one year. • $260 for three years.	$250 for two years.
Continuing education (CE) and other requirements	All ABB Diplomats (directors) and Certificants (managers, consultants and supervisors) are required to participate in the PEER program as a condition for maintaining their ABB certification. Under the PEER program, ABB required a documented 2.4 CEUs (24 contact hours) of acceptable CE every two years.	Diplomats must accumulate **150 contact hours** of CE over three years.	CE is only required for clinical chemistry or toxicological chemistry certificates: • Required to obtain a minimum of **20 contact hours** of continuing education per year. • Must submit documented proof during renewal of certification.	Diplomats will be notified every two years of the CE requirement. CE activities must be obtained during the two-year period (January 1 – December 31) immediately prior to submitting documentation and must total **at least 50 hours for the preceding two years.** In addition to attesting to completion of the required CE, Diplomats must submit the current CE renewal fee by **February 1** of the appropriate year in order to remain in the directory of active Diplomats.

Training and Educational Resources

Free Online Resources

The following resources are grouped by capability category; headers are hyperlinked to the that section of this document, should you need to reference it.

General Resources

- American Society for Clinical Pathology (ASCP)
- Lab Management University
- Clinical Laboratory Management Association (CLMA)
- Commission on Office Laboratory Accreditation (COLA)
- Health Information Technology
- The Joint Commission
- Competency Guidelines for Public Health Laboratory Professionals: CDC and APHL. Morbidity and Mortality Weekly, Supplements May 15th, 2015/ 64(01); 1-81.
- US Centers for Disease Control and Prevention (CDC)
- Intro to Public Health Laboratories (CDC 101 Course)

Quality Management Systems (pg. 6)

- CMS
- CLIA Regulation Requirements:
  - Brochure #1: How do they affect my laboratory?
    Summary of the updated requirements from the CLIA regulations (1/24/2003)
  - Brochure #2: Verification of Performance Specifications
  - Brochure #3: Calibration and Calibration Verification
  - Brochure #4: discontinued 12/31/2015
  - Brochure #5: How to Obtain a CLIA Certificate
  - Brochure #6: How to Obtain a CLIA Certificate of Waiver
  - Brochure #7: Laboratory Director Responsibilities
  - Brochure #8: Proficiency Testing
  - Brochure #9: Complaints, Do You Have a Concern About a Laboratory's Operation?
  - Brochure #10: What Do I Need to Do to Assess Personnel Competency?
  - Brochure #11: CLIA Individualized Quality Control Plan Introduction (IQCP)
  - Brochure #12: CLIA IQCP, Considerations When Deciding to Develop an IQCP
  - Brochure #13: CLIA IQCP, what is an IQCP?
- Clinical Laboratory Standards Institute (CLSI) Guidelines and Quality Management Systems
- College of American Pathologists (CAP) Laboratory Accreditation Checklists
- Prudent Practices in the Laboratory; Handling and Management of Clinical Hazards (2001) National Academies of Science Engineering and Medicine. Free download at Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, Updated Version | The National Academies Press
- CLIA Overview and Personnel Competency
- Employee Competency Assessment Program
- Testing Validation and Verification
  - Presentation by Eileen Burd at 2011 APHL TB Conference
  - Verification of FDA-cleared tests (reference Cumitech 31A, CLIA brochure #2 or CLSI M52)
  - Verification of Commercial Microbial Identification and Antimicrobial Susceptibility Testing Systems (reference CLSI M52)
  - Validation to establish performance claims (tests that are not FDA-cleared) (reference Cumitech 31A)

Management and Leadership (pg. 7)

- Americans with Disabilities Act
- Major Laws of the US Department of Labor
- Federal Employment and Labor Laws (for informational purposes; should not be used for legal advice. Please consult a lawyer for legal advice)
- Federal Policy for the Protection of Human Subjects (Common Rule, HHS)
- Proposed Revised Common Rule (HHS)
- Institutional Review Boards (US Food and Drug Administration)
- Budgets (National Conference of State Legislatures)
- Veterans Preference in Hiring (US Office of Personnel Management)

Ethics (pg. 7), Research (pg. 11) and Communications (pg. 8)

- OSHA Laboratory Standards
- Federal Select Agent Program (2022 version)
- American Society for Microbiology (ASM)/ABMM Laboratory Biosafety
- Biosafety in Microbiology and Biomedical Laboratories (BMBL)
- Biosafety in the Laboratory: Prudent Practices for Handling and Disposal of Infectious Materials (1989); National Academies of Science Engineering and Medicine

Emergency Management and Response (pg. 8)

- COOP Brochure (FEMA)
- Office of National Continuity Programs (FEMA)
- NIMS - National Incident Management System (FEMA)
- Emergency Management Institute | Independent Study Program (FEMA)
- ICS Resources

Workforce Training (pg. 8)

- American Society for Clinical Pathology
- Lab Management University
- Clinical Laboratory Management Association
- CMS
- CLIA
- Competency Guidelines for Public Health Laboratory Professionals: CDC and APHL. Morbidity and Mortality Weekly, Supplements May 15, 2015/ 64(01); 1-81.
- Intro to Public Health Laboratories (CDC 101 Course)

Surveillance (pg. 9)

- US Centers for Disease Control and Prevention (CDC)
- Intro to PH Surveillance (CDC 101 Course)
- Intro to Epidemiology (CDC 101 Course)
- World Health Organization
- Public Health Surveillance—Purpose and Characteristics (Self-study course)
- Intro to Public Health Surveillance 101 (Slides and free webinar course)

Informatics (pg. 9)

- HIPAA
- What is Protected Health Information?
- What does Protected Health Information include?
- Health Information Exchange
- HL7 Data Transmission (Using LOINC and SNOMED) Example and Explanation
- Coding Standards: What the difference between ICD, CPT, LOINC and SNOMED CT?
- SNOMED CT and HL7 Bringing Standards Together
- Bioinformatics
- Introduction to Public Health Informatics (CDC 101 Course)

Scientific Discipline Specific Topics—Microbiology (pg. 9), Molecular Diagnostics, Toxicology, Chemistry (pg. 10)

- American College of Medical Genetics and Genomics. Standards and Guidelines for Clinical Genetics Laboratories (General laboratory and Subject based materials)
- Gene Tests and Gene Reviews
- National Comprehensive Cancer Network® (NCCN®) Clinical Practice Guidelines in Oncology
- Catalogue of Somatic Mutations in Cancer (COSMIC)
- Clinical case studies, reports and reviews published in scientific journals specializing in molecular genetics, molecular diagnostics, microbiology and oncology are a good source of information
- Journal of Analytical Toxicology
- Therapeutic Drug Monitoring Journal
- Morbidity and Mortality Weekly Report
- Topic Specific PowerPoint Lectures by Dr. Roger L. Bertholf:
    - Introduction to Laboratory Medicine (33 slides)
    - Statistics for Laboratorians (220 slides)
    - Review of Analytical Methods—Spectrophotometry (74 slides)
    - Review of Analytical Methods—Electrochemistry (40 slides)
    - Immunochemical Methods (93 slides)
    - Proteins and Electrophoresis (47 slides)
    - Fertility and Tumor Markers (72 slides)
    - Clinical and Forensic Toxicology (77 slides)
    - Therapeutic Drug Monitoring (43 slides)
    - Forensic Toxicology: Screening (48 slides)
    - Forensic Toxicology: Confirmation (59 slides)
    - Molecular-imprinted Polymers (13 slides)
    - GI Tumor Markers (22 slides)
    - Human Subjects Protection (23 slides)
    - Research Ethics (41 slides)
    - Medical Errors: Causes and Prevention (66 slides)

Free CDC TRAIN Learning Network Trainings

Trainings can be found on the CDC TRAIN website. If you do not already have a TRAIN account you can set up an account free. All you need to do once you have site access is to enter in the Course ID # and the course will be located.

This section will be updated as more courses are developed or identified.

Course Title and TRAIN ID Number	Time	Sponsor	Additional Training Course Details	Learning Objectives
Biosecurity and Biosafety **ID: 1056335**		EU CBRN CoE Initiative	In this module we investigate the standards and procedures in place for biosafety—reducing the risk that a disease-causing agent infects a laboratory worker or escapes the laboratory and infects the community outside the lab and biosecurity, and defending against the deliberate release of infectious agents from the confines of the laboratory for malicious purposes. We will look carefully at the application of special equipment, physical protection, best practices and techniques for achieving a safe and secure laboratory environment. • Lesson 4-1: Biosafety and Biosecurity • Lesson 4-2: Acquiring Bio-Weapon Capability • Lesson 4-3: Terrorist Biosecurity Violations • Lesson 4-4: Preventing Biosecurity Breaches	• Compare and contrast biosafety and biosecurity concepts, goals and measures. • Assess acceptable risk inside and outside of the laboratory. • Understand levels of risk posed by different biological agents. • Understand and apply knowledge of risk groups and biosafety levels. • Assess the risks and consequences of terrorist use of biological agents. • Apply methods for preventing breaches in biosecurity and biosafety. • Analyze a qualitative risk and threat assessment. • Understand national legislation and international regimes for criminalizing and punishing attempts to acquire, develop, produce and possess biological agents for offensive purposes.
Bloodborne Pathogens Update (OSHA) Training **ID: 1030583**	20 min.	Virginia Department of Health	This training is provided to you in compliance with OSHA's requirement to provide training on this topic. The information in this course will help reduce your risks for occupational exposure to disease and tell you what to do if you are exposed while on the job. There is a test at the end of this course, which will require a score of at least 80% to successfully complete this course.	• Define "bloodborne pathogens." • Recognize how these diseases are transmitted. • Determine your risk of exposure. • Protect yourself from exposure. • Respond appropriately if exposed. • Describe your right to medical evaluations.
Core Competencies for PH Officials **ID: 1058507**	60 min.		This archived webinar presented by the Association of Public Health Nurses, a member of the Quad Council of Public Health Nursing Organizations, and the Public Health Foundation focuses on the revised Core Competencies for Public Health Professionals (Core Competencies) released by the Council on Linkages Between Academia and Public Health Practice in June 2014. Originally presented in June 2015, this provides an overview of the 2014 version of the Core Competencies, changes made in this version and how these changes address feedback from the public health community, and tools and resources available to support use of the Core Competencies.	• Describe the Core Competencies. • Describe the revisions made to the Core Competencies. • Identify at least three tools and resources that can assist public health professionals or organizations with using the Core Competencies.
Core Microbiology Skills **ID: 1035332**	30-40 min.	CDC	In this series of short videos, you will learn several core microbiological skills that are used in public health, clinical and research laboratories. Use these videos as an adjunct to training given in your laboratory. The skills we will cover are how to:	• Make a smear. • Do a gram stain. • Perform a wet and tube motility. • Perform a slide and tube catalase test. • Do an oxidase test.

Course Title and TRAIN ID Number	Time	Sponsor	Additional Training Course Details	Learning Objectives
Disability Rights Course **ID: 1026940**	2 hours	DBTAC—New England ADA Center	The Disability Rights Course is a free, self-paced web course available 24/7 that provides an overview of disability rights laws. The course takes approximately two hours and includes real life scenarios, quizzes and a final exam. *Note: it prompts you in TRAIN to go to second level of registration which indicates a cost is necessary, but the next screen doesn't require payment—course is FREE.*	• Have a general understanding of the major federal disability rights laws (the Americans with Disabilities Act, the Fair Housing Act, Section 504 of the Rehabilitation Act and the Air Carrier Access Act). • Be able to assess what laws apply in different discrimination scenarios. • Have resources for help and information about disability rights laws.
Federal Regulations and Agencies **ID: 1029954**	25 min.	UNC Gillings School of Global Public Health	This training provides an overview of federal agencies as regulators and advisors when it comes to public health.	• Provide insight into jurisdictional issues that arise in public health. • Define certain federal agencies and distinguish between their regulatory power and advisory roles. • Discuss the HIPAA and its implications on public health. • PH Competencies; 7A1; 7A2; 7B1; 7B2; PHP Capability 6 fxn 2; 1.3 and 1.6.
Grant Writing and Budgeting for PH Programs **ID: 1029853**	25 min.	UNC Gillings School of Global Public Health	This training gives an introduction to funding for public health in America since September 11, 2001 and gives an overview of grant writing as a way to secure funding for public health programs.	• Describe the history of and the current environment for public health funding. • Define federal, state, and local government funding priorities and mechanisms, as well as private foundations and other potential funders. • Recognize the major content areas of a grant proposal and describe how they are developed, including budgets, workplans, technical approaches and evaluation plans. • 7A6 – Tier One – Core Competencies for PHP
Good Laboratory Practices for Molecular Genetics Testing (PACE) **ID: 1044041**	90 min.	PACE	This online learning module is presented in first person. This means the learner is actually depicted as getting an assignment and doing the work throughout the course. This training is not meant to be prescriptive. There are several different ways to obtain information and perform the tasks described in the training. Examples are provided as potential options. The characters and scenarios in this training are fictitious and are based on possible real-life situations. For the purposes of this training module, the manufacturer details are fictional and do not indicate CDC's support for any commercially available product or service. Although some of the recommendations in this training exceed CLIA and other requirements that pertain to molecular genetic testing, following these good laboratory practices will likely lead to improvements in the quality and use of genetic laboratory services and should improve health outcomes for the public.	• Describe the application of the CLIA requirements to molecular genetic testing. • Select quality assurance measures for molecular genetic testing which are consistent with good laboratory practices. • Develop procedures and processes for a molecular genetic test which are consistent with regulatory requirements and good laboratory practices.
Health and Safety Essentials for Workers **ID: 1069167**	2 hours	CDC	This level of training will delve deeper into the content of infectious diseases of public health significance to develop the skills to recognize hazards and mitigate them. The purpose of this course is to prevent and reduce work exposures to the Ebola virus and other infectious diseases using direct training and the train-the-trainer method.	• Explain the importance of awareness and site-specific level training. • Describe the association of infectious agents to the disease. • Describe means of transmission for Ebola virus disease and other high consequence pathogens. • Explain the importance of conducting risk assessments in identifying potentially infectious material, chemical and safety hazards. • Describe what is meant by contact, droplet and airborne transmissions in infection control. • Describe the three routes of exposure. • Describe how personal hygiene practices can reduce the risk for exposure. • Describe appropriate selection of personal protective equipment (PPE) for use with potentially infectious materials. • Describe limitations of PPE.
HIPAA **ID: 1041019**	25 min.	UNC Gillings School of Global Public Health	This training provides public health professionals with a summary of the Health Insurance Portability and Accountability Act (HIPAA).	• Describe the Health Insurance Portability and Accountability Act of 1996. • Discuss the Privacy Rule and its purpose. • Determine when private information can or cannot be disclosed. • Explain how HIPAA and the Privacy Rule affect public health practice and research.

Course Title and TRAIN ID Number	Time	Sponsor	Additional Training Course Details	Learning Objectives
Incident Command System	150 min.	UNC Gillings School of Global Public Health	This training is designed to help public health professionals at the local level integrate use of the ICS into a common public health department activity: investigating a disease outbreak. This training has accompanying activities which are an integral part of the training content. All activities will be provided as you progress through the training. Please note: prerequisites for this training are completion of ICS trainings 100, 200, and 700 and training or experience in disease outbreak investigation. In addition, completion of ICS 300 is strongly recommended for persons who might serve as Command Staff or General Staff. These trainings can be accessed from the FEMA Web site.	• Describe how ICS can benefit disease outbreak investigations undertaken by local public health department staff. • Use appropriate ICS terminology to describe the roles and tasks that public health staff assume in an out-break investigation. • Give examples of the ICS steps taken in outbreak investigations. • For a hypothetical disease outbreak: Demonstrate the ability to develop an Incident Action Plan, carry out an operational briefing, and formulate positions and an organizational chart for how an outbreak response might be organized.
Introduction to PH Laboratories **ID: 1059672**		CDC	Public health laboratories focus on diseases and the health status of population groups. They perform limited diagnostic testing, reference testing and disease surveillance. They also provide emergency response support, perform applied research and provide training for laboratory personnel. This course covers the public health laboratory infrastructure and core functions of state public health laboratories. The course introduces learners to laboratory safety, procedures for collecting and submitting samples for testing in public health laboratories and how lab results are used in public health practice. This course is part of the Public Health 101 Series—a set of courses that introduces learners to public health and the core sciences of public health practice. The core scientific components span topics in epidemiology, public health informatics and surveillance, prevention effectiveness, and public health laboratories. Each course includes a four-step approach to solving public health problems. The Public Health 101 Series can benefit the following groups: • Those who work in public health but who have not had formal training in a particular core area. • Those who have had public health education and would like a refresher. • Students or others interested in pursuing careers in public health. • Health educators and instructors responsible for the training and professional development of the public health workforce. To locate other courses in this series, search by keyword “Public Health 101.”	• Describe the role of public health laboratories. • Summarize the core functions of state public health laboratories. • Describe the parts that are common to all public health laboratory system infrastructures. • Recognize the need for different laboratory levels and safety practices. • Explain the necessity for communicating with a laboratory when collecting and submitting samples for testing. • Describe how laboratory results are used to affect public health.
Intro to Policy Evaluation in Public Health **ID: 1064948**	2 hours	CDC Office of the Associate Director for Policy	The two-hour online course, designed for public health practitioners, introduces the learner to the use of policy evaluation in public health and provides specific instruction on applying evaluation methods throughout a policy process. Instructional content describes what “policy evaluation” is and will enable the learner to have a better understanding of how to apply the CDC Evaluation Framework to conduct an evaluation of adopted policies that may impact public health.	
Introduction to Management in PH **ID: 1019168**		CDC		
Introduction to PH Surveillance **ID: 1030016**	40 min.	UNC Gillings School of Global Public Health	This issue of FOCUS describes the process and reasoning behind the surveillance methods and interpretation used to inform public health practice.	• Define surveillance and explain surveillance systems. • Describe basic surveillance techniques by person, place and time. • Touch on the importance of standardization when comparing surveillance data. • Provide an overview of how to present surveillance data.

Course Title and TRAIN ID Number	Time	Sponsor	Additional Training Course Details	Learning Objectives
Laboratory Biosafety Levels **ID 1030020**	20–30 min.	The NC Institute for Public Health	This issue of FOCUS describes some of the differences between the biosafety levels, with examples of organisms studied and the precautions that must be taken in laboratories at each level.	• Define barriers and procedures used by laboratories to protect workers and others from infection. • Describe the four biosafety levels and the protective measures used by each type of laboratory when handling infectious materials. • Provide examples of the types of biological agents handled in each type of laboratory. • Describe typical places where each type of laboratory can be found in the US. • 6A3; 6B3; 4.2 – Tier One – Core Competencies for PHP
Legal Aspects of Public Health and Food Safety **ID: 1048259**	1 hour	CDC	Food safety is a unique and critical role filled by public health agencies. In the event of a foodborne illness outbreak investigation, you may wonder what personal information is protected by privacy laws and what may be shared. You may also wonder about the source and scope of your public health authority to keep the public safe from foodborne illnesses. This one-hour course is an introduction to legal issues that arise in public health food safety, from surveillance and outbreak investigation through restaurant inspections and detention of food. The content for the course was developed in partnership with the Network for Public Health Law, whose Eastern Region Office contributed invaluable practical experience and knowledge.	• Identify federal privacy requirements related to food safety surveillance and foodborne illness outbreak response. • Describe the source and scope of state and local authority related to food safety. • Explain the administrative process for developing food safety regulations. • Identify the food safety control measures available to state and local authorities. • List common legal issues encountered during the enforcement of state and local food safety provisions.
Routine Microscopy Procedures: Basic Microbiology Curriculum **ID: 1046095**	90 min	CDC	This eLearning course is designed to familiarize laboratorians with routine microscopy procedures used in the microbiology laboratory. Laboratorians will explore the required steps for a smear preparation as well as the requirements for preparing and interpreting the results of Gram stains, wet mounts, potassium hydroxide and India Ink procedures. The Routine Microscopy eLearning course is the second of six courses in a Basic Microbiology Curriculum. Additional courses include: • Basic Microscopy (ID1044412) • Basic Culture Media and Isolation Techniques (ID: 1048274) • Biochemicals & Gram Positive Organism ID (ID: 1051106) • Biochemicals & Gram Negative Organism ID (ID: 1051413) • Antimicrobial Susceptibility Testing (AST) (ID: 1050165) Each of these courses contains laboratory exercises for the participant to complete with their mentor or supervisor to demonstrate understanding of the content. A facilitator guide was also created to assist the mentor or supervisor with administering the laboratory exercises.	
Practical Law for Public Health Officials **ID: 1028438**	90 min.	CDC	Do you know how the law contributed to motor vehicle safety, vaccination, or safer workplaces? Law reform or litigation has played a part in most of the greatest public health achievements in the 20th century. As public health professionals and leaders, understanding public health law and how to use it is essential to protecting the public's health. In this module, you will learn how to assess when to involve legal counsel, how to get effective legal advice, and what laws will affect your decision-making ability when facing public health threats. By the end, you will be able to use core concepts of public health law to more effectively protect the public's health while avoiding legal trouble.	• Recognize legal issues. • Formulate legal questions. • Implement effective strategies for working with legal counsel. • Describe key principles of public health law. • Identify key public health laws that govern leadership's responsibilities, authority and limitations.

Course Title and TRAIN ID Number	Time	Sponsor	Additional Training Course Details	Learning Objectives
Public Health Law **ID: 1065624**		CDC	This course has Continuing Education available. The US Constitution plays a central role in the daily practice of public health today. Traditionally, the Constitution has been interpreted as granting the government broad authority to protect the public health. In the past 25 years, however, judicial decisions have placed substantial limits on this power. It is more important than ever for public health officials to understand the power and limits of their authority. Having a legal background or understanding of the constitutional power and limits of this authority equips public health leaders with the tools necessary to ensure their policies are constitutionally permissible, and capable of withstanding legal challenge. This online training teaches public health officials how to most effectively use the tools of law and policy—within the parameters of the US Constitution—to achieve their public health goals.	• Name two historical events that helped shape the practice of public health law today. • Identify an example that illustrates how history shapes government's modern-day authority. • Identify two constitutional limitations on the ability of the government to enact PH regulations. • Name the two things that the government must balance when creating PH laws and policies.
Public Health Essentials Online **ID: 1051672**	45 min.	AZ PH Training Center	This multimedia training will provide a dynamic look at some of the most fundamental aspects of public health from the unique points of view of members of the workforce and of community members as well. Learners will gain a grounded understanding of the Three Core Public Health Functions and the Ten Essential Public Health Services. Learners are asked to develop an action plan detailing immediate, short- and long-term goals that they will strive towards in building a capacity to better serve their public health community. The goals in the action plan relate to the learner's role in the delivery of services as they relate to the systems management section of the Public Health essentials continuum.	• Describe and define public health. • Identify the role your work plays in public health. • Define three social determinants of health. • Recognize the three Public Health Core Functions. • Relate examples of each of the Ten Essential PH Services. • Discuss the role individuals/ teams in the workplace in good health outcomes for the community.
Public Health Surveillance **ID: 1030076**	40 min.	UNC Gillings School of Global Public Health	This presentation gives an overview of public health surveillance.	• Define public health surveillance. • Identify uses of public health surveillance. • List sources of public health surveillance data.
Public Health and the Incident Command System **ID: 1046620**	42 min.	CDC	This course provides an overview of applying Incident Command System to Public Health to plan for and respond to disasters. The goal of the course is to build skills so that the public health worker can play an integral role in the Incident Command organization and structure. Learning objectives focus on 'participating in improving the organization's capacities' which is competency 3.3 under 'Plan and Improve Practice.'	• Recognize the key concepts of the disaster cycle. • Understand the relationship between Public Health and response partners using the Incident Command System. • Identify the various Incident Command roles of Public Health during a disaster. • Describe the importance of pre-incident planning and training of Public Health personnel.
PH Code of Ethics **ID: 1050890**	35 min.	UNC Gillings School of Global Public Health	This training presents the 12 principles for the ethical practice of public health; explanations and a practical application of each principle; and suggestions of how to use the Public Health Code of Ethics. It begins with a brief description of what a Code can and can't do, and the process by which the Public Health Code of Ethics was written.	• Describe how an aspirational code can guide an ethical discussion. • Describe a situation where a given ethical principle applies in public health. • Identify means of creating an ethical environment within public health organizations.
Public Health Confidential: Federal Overview **ID: 1064343**		CDC	Public Health 101: • A short course • Introduction to PH Surveillance • Introduction to PH Informatics • Introduction to PH • Introduction to PH Laboratories • Training Plan • Introduction to Epidemiology • Introduction to Prevention Effectiveness	

Course Title and TRAIN ID Number	Time	Sponsor	Additional Training Course Details	Learning Objectives
PH Financial Management **ID: 1012722**	7 hours	CDC	This course provides an overview of the principles of finance, discussions regarding finance issues related to public health, and understanding of financial management of public health programs and activities. • Module I will focus on basic concepts of budgeting in public health organizations. • Module II in this course examines issues primarily related to managerial or cost accounting. The primary focus of managerial accounting is the use of financial data in administrative decision making. • Module III focuses specifically on capital budgeting decisions. • Module IV determines the importance of integrating strategic and financial planning. Financial plans ensure that resources are allocated in a way that is consistent with the strategic direction of the agency.	
PH Laboratory Diagnosis **ID: 1030022**	40 min.	UNC Gillings School of Global Public Health	Provides an overview of the pathogens tested in public health laboratories and describes some commonly used lab tests.	• Provide an overview of pathogens tested in public health laboratories. • Describe laboratory tests commonly used in outbreak investigations.
Recognition and management of Bioterrorist Agents: An Overview **ID: 1030369**	30 min.	UNC Gillings School of Global Public Health	This presentation discusses biological agents that could be used by terrorists, the potential for their use and the epidemiology and recognition of these agents.	• Understand the risks posed by bioterrorism in the USA. • Be aware of potential bioterrorist agents. • Understand the epidemiology and recognition of bioterrorist agents.
Responding to Unethical Events in PH **ID: 1050904**	10 min.	UNC Gillings School of Global Public Health	This training provides an overview of possible responses to behaviors or decisions that are clearly unethical. It is part of the “Public Health Ethics” training series developed to promote the ethical practice of public health by teaching about the ethical principles of public health and by providing resources for creating an ethical climate in public health agencies and schools of public health.	Describe the range of possible responses to an event that is clearly unethical.
Recognizing Biosafety Level **ID: 1046752**	10 min.	CDC	Quick-learn lessons help you develop basic public health knowledge and skills in specific areas through interactivity and practice. Learn how to recognize characteristics of the four biological safety levels.	

Course Title and TRAIN ID Number	Time	Sponsor	Additional Training Course Details	Learning Objectives
National STD Curriculum **ID: 3489**			The new National STD Curriculum website addresses the epidemiology, pathogenesis, clinical manifestations, diagnosis, management and prevention of STDs. The curriculum is free, up-to-date, and integrates the most recent CDC STD Treatment Guidelines. Funded by a grant from the CDC and developed by the University of Washington STD Prevention Training Center and the University of Washington, this website replaces the former CDC STD Self Study Modules for Clinicians. Free CME and CNE credits are available from the seven self-study/quick reference modules and the Question Bank section which features 100+ interactive board-review style questions. Each module can be completed within 60 minutes and 1 CME and CNE credit is available through the National STD Curriculum website. Time needed to complete a Question Bank topic varies by STD but ranges from 30 minutes to 1.75 hours so available CE varies from .5 to 1.75. The seven modules available through TRAIN: Chlamydia, Gonorrhea, Herpes Simplex Virus (HSV)–Genital, Human Papillomavirus (HPV), Pelvic Inflammatory Disease (PID), Syphilis and Vaginitis. The 12 Question Bank topics through TRAIN: Bacterial Vaginosis, Candidiasis–Vulvovaginal, Chancroid, Chlamydia, Epididymitis, Gonorrhea, Granuloma Inguinale, Herpes Simplex Virus–Genital, *Lymphogranuloma venereum*, *Mycoplasma genitalium*, Proctitis, Proctocolitis, Enteritis and *Trichomoniasis*.	For each STD, the learning objectives for the modules and/or the Question Bank usually include some of the following: • Summarize the epidemiology in the United States. • Describe microbiology, life cycle, and transmission. • Discuss the clinical manifestations in men, women, and children. • Compare laboratory diagnostic methods used to diagnosis. • Discuss serologic screening in asymptomatic persons. • List the CDC-recommended treatment regimens. • Summarize counseling and education messages for individuals with that STD.
Speaking with the Public **ID: 1066814**	5 online courses	CDC	CDC offers five online health literacy courses for health professionals. Speaking with the Public Online Training is part of health literacy training available to the public.	

Educational Programs, Courses and Fee-based Trainings

- APHL: Emerging Leader Program
- CLSI: Quality Laboratory Management System (LQMS) Online Certificate Program
- CAP: Laboratory Safety and Compliance Programs
- CAP: Short presentations on emerging topics (free for CAP members only)
- AAB: Molecular Diagnostics Seminar
  Full day seminar "Clinical Genomics: A Review of Technology and Clinical Applications" by Gregory Tsongalis:
  - AAB Online Courses
  - Immunohematology
  - Immunology and Serology
  - Microbiology
  - Molecular Diagnostics
  - PER Basic Laboratory Knowledge
  - PER Chemistry Review
  - Direct Patient Access to Laboratory Test Results Webinar
- AAB: Hematology, Microbiology and Serology Course
  In-person seminar and on-line course available
- AACC: Professional Practice in Clinical Chemistry
  Week-long intensive training course for laboratory medicine
- American Society of Criminology: Toxicology for chemists
  Online eight-week course with live lectures and notes
- Association for Molecular Pathology (AMP) Course
  In person course prior to AMP meeting
- Forensic ED: Online Trainings
  Relevant Topics: Standard Operating Procedures, Ethics of Laboratory Leadership, Clinical Chemistry, Molecular/ DNA, Mass Spectrometry
- The Laboratory Safety Institute

Board-sponsored Resource Guides

ABB: American Association of Bioanalysts

- General Knowledge for the Clinical Laboratory Director
- PER Basic Knowledge Manual
- PER Handbook
- PER Q & A Book
- Review Manual for Public Health Microbiology
- Total Quality Management (TQM) in the Clinical Laboratory

ABCC: American Board of Clinical Chemistry

ABCC Molecular Diagnostics Certification Examination Study Resource Guide

ABMM: American Board of Medical Microbiology

ABMM Examination Content

ASCP: American Society for Clinical Pathology

Board of Certification (BOC) Study Guide: Clinical Laboratory Certification Examinations 5th Edition, ISBN:9780891895879 by Patricia A. Tanabe, MPA, MLS(ASCP) E. Blair Holladay, PhD, SCT(ASCP), ASCP Board of Certification Staff.

ASM Committee on Post Graduate Educational Programs (CPEP)

- CPEP Fellowship Essential Medical Microbiology
- CPEP Fellowship Essentials in Medical Immunology

Recommended Reference Books or Journals

Note: A survey conducted of board-certified individuals recommended the books highlighted in red as most useful when preparing for the board examination.

General Laboratory and Quality Management

ISBN Number	Name	Est. Cost
N/A	Competency Guidelines for Public Health Laboratory Professionals: CDC and the Association of Public Health Laboratories. (2015). MMWR 64(01); 1-81.	$0
ISBN-13: 978-1555816209 ISBN-10: 1555816207	Biological Safety: Principles and Practices, 5th ed., Editors: Dawn P. Wooley, Karen B. Byers (2017)	$150
ISBN-13: 978-1365080890 ISBN-10: 1365080897	Biosafety in Microbiology and Biomedical Laboratories (BMBL), 6th Edition (2020)	$0
ISBN-13: 978-11-683-67391-0	Garcia, L.S. (2013). Clinical Laboratory Management. (3rd.) Wash-ington D.C.: ASM Press.	$190–245

ISBN Number	Name	Est. Cost
ISBN-13: 978-0943903125 ISBN-10: 0943903122	Harmening, D.M. (2012). Laboratory Management: Princi-ples and Processes (3rd ed.). St. Petersburg, FL: D.H. Pub-lishing & Consulting Inc.	$30-60
ISBN-13: 978-1416002871 ISBN-10: 1416002871	McPherson, R.A. & Pincus, M.R. (2011). Henry's Clinical Diag-nosis and Manage-ment by Laboratory Methods (22nd ed.). Phil-adelphia: W. B. Saunders Company. (Part 1 ONLY)	$30
ISBN-13: 978-0397551491 ISBN-10: 0397551495	Snyder, J.R., & Wilkinson, D.S. (1998). Management in Laboratory Medicine (3rd ed.). Philadelphia: Lippincott, Williams, & Wilkins.	$20
ISBN-13: 978-1605855479 ISBN-10: 1605855472	Varnadoe, L.A. (2008). Medical Laboratory Management and Supervision. (2nd ed.). Florida: Priority ed.	$80
ISBN: 1-56238-861-4	Clinical and Laboratory Standards Institute (2017 review of 1st edition). Quality Management System: Leadership and Manage-ment Roles and Responsibilities; Approved Guideline QMS 14-A. Wayne, PA: CLSI.	$54–170
ISBN: 978-1-68440-044-7 (PDF) ISBN: 978-1-68440-043-0 (Print)	Clinical and Laboratory Standards Institute (2019). A Quality Management System Model for Laboratory Services; Approved Guideline - Fourth Edition QMS 01. Wayne, PA: CLSI.	Member price: $54–170 List Price: $200.00
ISBN: 1-56238-759-6 (Print) ISBN: 1-56238-760-X (Eletronic)	Clinical and Laboratory Standards Institute (2011). Quality Management System: Continual Improvement; Approved Guideline - Third Edition QMS 06-A3. Wayne, PA: CLSI.	$180
ISBN-10: 0875532977 ISBN-13 978-0875532974	Certified in Public Health Exam Review Guide Paperback – October 31, 2018 by PhD Karen D. Liller (Author, Editor), Jaime A. Corvin (Editor), Hari H. Venkatacha-lam (Editor)	$70–80

Clinical Chemistry and Toxicology

ISBN Number	Name	Est. Cost
ISBN-13: 978-0128220931 ISBN-10: 0128220937	Self-Assessment in Clinical Laboratory Science II. Published by AACC.	$115
ISBN-13: 978-0128154991 ISBN-10: 0128154993	Contemporary Practice in Clinical Chemistry, by William Clarke, 4th Ed. AACC Press; Washington, DC, 2020.	$130
ISBN-13: 978-0323036580 ISBN-10: 0323036580	Clinical Chemistry: Theory, Analysis, Correlation, Kaplan & Pesce, 5th Ed.	$45–110
ISBN-13: 978-1496335586 ISBN-10: 1496335586	Clinical Chemistry: Principles, Techniques, and Correlations, (ed) Bishop, 9th Ed, particularly the "Enzymology" chapter.	$145
9780721601892 0721601898	Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Carl A. Burtis, Edward R. Ashwood, David Bruns (eds), WB Saunders, Saint Louis, MO.	$180–250
ISBN-13: 978-0781728454 ISBN-10: 0781728452	Medical Toxicology by Richard C. Dart	$60
ISBN-13: 978-0071354691 ISBN-10: 0071354697	The Pharmacological Basis of Therapeutics by Alfred G. Gilman, Louis S. Goodman, Theodore W. Rall, Ferid Murad.	$40
ISBN-13: 978-0931890031 ISBN-10: 0931890039	Analytical Procedures for Therapeutic Drug Monitoring and Emergency Toxicol-ogy by Randall C. Baselt	$32
ISBN-13: 978-0931890154 ISBN-10: 0931890152	Advances in Analytical Toxicology by Randall C. Baselt	$50
ISBN-13: 978-1594251580 ISBN-10: 1594251584	Principles of Forensic Toxicology by Barry Levine	$60–100

ISBN Number	Name	Est. Cost
ISBN-13: 978-1890883744 **ISBN-10: 1890883743**	500 Referenced Review Questions in Toxicology by Robert M. White, Sr.	Out of print; must buy used

Molecular Biology—Molecular Diagnostics

ISBN Number	Name	Est. Cost
Print-ISBN: 978-3642196768 **E-ISBN: 9783642196775**	Diagnostic Molecular Pathology in Practice: A Case-based Ap-proach. 2011. Iris Schrijver (ed). Springer, New York NY	$90
ISBN-13: 9780128228241 **ISBN-10: 0128228245**	Diagnostic Molecular Pathology 2nd edition. Gregory Tsongalis.	$50
ISBN-13: 978-0470654477 **ISBN-10: 0470654473**	Human Genetics and Genomics. Bruce R. Korf and Mira B. Irons. Wiley-Black-well. Hoboken, NJ.	$12–30
Print ISBN: 978-1588293565 **E-ISBN: 9781592599288**	Molecular Diagnostics: For the Clinical Laboratorian 2nd edition. William B. Coleman and Gregory J. Tsongalis (eds). Springer, New York, NY	$170–240
ISBN-13: 978-1437706963 **ISBN-10: 1437706967**	Thompson and Thompson's Genetics in Medicine. Robert Nussbaum, Roderick R. McInnes and Huntington F. Willard (eds), WB Saunders, Philadelphia, PA	$22–45
ISBN-13: 978-0323359214 **ISBN-10: 0323359213**	Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Carl A. Burtis, Edward R. Ashwood, David Bruns (eds), WB Saun-ders, Saint Louis, MO.	$225
ISBN-13: 978-0070318472 **ISBN-10: 0070318476**	Appleton and Lange's Outline Review in Clinical Chemistry. *Older reference book but still a good reference for fundamentals*	$20–50
ISBN-13: 978-1405169745 **ISBN-10: 1405169745**	Essential Medical Genetics. *Fairly high-level overview but provides a deep dive of detail.*	$13–40

Microbiology

ISBN Number	Name	Est. Cost
ISBN-13: 978-1608317332 **ISBN-10: 1608317331**	Lippincott's Illustrated Reviews: Microbiology; 3rd Edition; Richard A. Harvey et al., 2012 by Lippincott Williams & Wilkins	$50
ISBN-13: 978-1-683-67429-0 **ISBN-10: 1683674294**	Manual of Clinical Microbiology. 13th edition. Editors: James H. Jorgensen, Michael A. Pfaller, Karen C. Carroll, Guido Funke, Marie Louise Landry, Sandra S. Richter, David W. Warnock (2023) *Two volumes ($300 each or $450 for the set.)*	$225–450
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ISBN:1-56238-761-8 (Print) **ISBN:1-56238-762-6 (Electronic)**	Clinical and Laboratory Standards Institute (2019). A Quality Management System Model for Laboratory Services; Approved Guideline - Fourth Edition QMS 01. Wayne, PA: CLSI.	* See above
ISBN-13: 978-1562387594 **ISBN-10: 1562387596**	Clinical and Laboratory Standards Institute (2011). Quality Management System: Continual Improvement; Approved Guideline - Third Edition QMS 06-A3. Wayne, PA: CLSI.	$270
ISBN-13: 978-1683673910	Garcia, L.S. (2013). Clinical Laboratory Management. (3rd.) Washington D.C.: ASM Press.	$190–245

Exam-specific Preparation Resources

Question Bank Resources

General Resources

- Brainscape: HCLD Flashcards & Quizzes
- Cram Study Cards
- Quizlet: Search for topic area; there are many sets, but be careful as to the accuracy of the answers
- SKETCHY: Learning Made Unforgettable
- Study Stack: Laboratory Science Flashcards
- True Certs: NRCC Clinical Chemistry Real Practice Exam
- Varsity Tutor: Online Tutoring, Classes, and Test Prep

Exam/Certification-specific Resources

- Board Vitals: Medical Board Review, CME, & Question Bank
- LabCE: Exam Simulator for ASCP, AMT and AAB Exams

AAB: American Association of Bioanalysts

- ABB: Online Store
- ABB: PER Review of Molecular Diagnostics
- Quizlet: AAB PER Handbook
- Board Vitals: ABB Certification Exam Review Questions

ABMM: American Board of Medical Microbiology

- Studocu: ABMM Study Guide Practice material
- SCRIBD: ABMM Sample Questions
- StudyLib: ABMM Examination Guide

MLT/ASCP: Medical Laboratory Technician/ American Society for Clinical Pathology

- Mometrix Test Preparation: MLT/ASCP exam preparation book and flashcards; (book also available on Amazon)
- Study.com: MLT (ASCP) Medical Laboratory Technician: Study Guide & Exam Prep

Topical Resources

Chemistry

- Brainscape: Learn Clinical Chemistry Online
- ProProfs Quizzes: Clinical Chemistry Quiz Questions With Answers

Infectious Diseases

- AI's Bug of the Week

Microbiology

- APHL PHL Bench Scientist Collaborate Community: ASCP (M) Microbiology Certification Resources
  Note: only visible to members of the community; find within the Resources tab.
- Brainscape: Microbiology Made Easy with Adaptive Flashcards
- Jawetz's Medical Microbiology (Q/A at the end)
- Lippincott's Illustrated Q&A Review of Microbiology and Immunology; 2010; Bonnie A. Buxton, Lauritz A. Jensen, Randal K. Gregg; Lippincott Williams & Wilkins
- Medical Microbiology Questions and Answers Resource Books
- SCRIBD: 204 Questions On Microbiology
- Study.com: Intro to Microbiology practice tests and online courses
- Udemy: Microbiology Exam Questions Practice Test part 3

Molecular Diagnostics

- Brainscape: HCLD Molecular Diagnostics Flashcards & Quizzes
- *Molecular Diagnostics: Fundamentals, Methods, and Clinical Applications*, by Lela Buckingham

Quality Control

- BioRad: QC Workbook with Self Tests

APHL's Quizlet Board Certification Classroom

Over 130 flashcard study sets (over 8,400 flashcards) are available in the APHL Board Certification Classroom in Quizlet. Email leadership@aphl.org to request access.

Flashcard study set topics include:

- **Personnel and Employment Laws**
  - HR management
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  - HIPAA
  - Healthcare Laws
  - Laboratory Accreditation and Regulatory Requirements
- **General CLIA Provisions**
  - CLIA position qualifications and responsibilities
  - Directing Laboratory Testing Functions
  - Record Retention
  - Patient Test Management
- **Administration**
  - Budgets
  - Cost accounting
  - Facilities
  - Reimbursement
  - Billing
  - Test codes
  - Medicare and Medicaid
- **Microbiology, Bacteriology, Virology**
  - Virology (DNA viruses, negative sense RNA viruses, positive sense RNA viruses)
  - Gram negative and positive bacilli
  - Gram positive branching filamentous rods
  - Parasitology and Mycology
  - Gram positive and negative cocci
  - Microscopic clinical identification
  - Vector borne agents/diseases
  - Antibiotics and Abic resistance
  - Differential and Selective Media
  - Immunology
  - Bacterial identification and differentiation
  - Stains
- **Molecular and Molecular Diagnostics**
  - Amplification of Nucleic Acids
  - Principles of molecular diagnostics
- **Laboratory Safety and Security**
  - OSHA
  - General Safety
  - Training
  - Biohazards
  - Chemical hazards
  - Waste
  - Regulatory bodies
  - Fire
  - Reagent labeling
  - Packaging and shipping
  - IATA and DOT requirements
  - GHS and NFPA (and symbols)
  - Chemical Safety and Disposal
  - Sterilization
- **QA/QC**
  - New methods
  - PTs
  - Sensitivity and specificity
  - Validations
  - QMS
  - HIPAA
- **AAB MT Basic Knowledge Topics**
- **Laboratory Information Management Systems**
- **Clinical Chemistry**
- **Epidemiology**
- **Diseases and Causative Agents**
- **Infectious Disease Case Studies**
- And more...

APHL Board Certification Exam Boot Camp & ColLABorate Community

APHL offers a Laboratory Director Board Examination Boot Camp, a multi-week virtual program designed to help you jump-start your studies for the Board Exam.

APHL also offers free access to a ColLABorate Board Certification Exam Boot Camp Community, a platform for resource sharing and interactive dialog between individuals considering or preparing for Board examination and individuals participating in the APHL sponsored Boot Camp Sessions. Membership in the community offers access to:

- Board-certified volunteers willing to provide valuable advice and mentorship regarding board certification, exam preparation, recommended resources, and answers to exam and other related questions
- Searchable discussion threads to find answers to frequently asked questions
- A collection of examination-related resources and guides

If you are interested in accessing either of these resources, please email leadership@aphl.com.

Exam Preparation Tips From Past Examinees

The following are tips and suggestions taken directly from individuals who have taken and passed a board exam; they are not endorsed by APHL or its members. The contents are solely based on the individual's experience, and it is the sole discretion of the candidate to prepare based on the recommendations from the certifying agency.

Preparation

- Talk with previous examinees about what study tools helped them depending on the specific examination you choose, especially for the less commonly taken exams like NRCC.
- Use the resources provided by APHL (Guide, Quizlet, Boot Camp) to help you identify what information you need to know and/or review.
- There are MANY free study resources available on the internet to review information or to prepare for answering exam questions; even questions geared toward MLT, nursing and medical school exams can be very helpful.
- Start early in your preparation and begin with the test you feel the least competent so you can keep reviewing. Typical preparation is four to six months for ABB and six months or more for ABMM.
- Creation of flashcards or review of the flashcards in Quizlet are a great help when studying or trying to memorize exam material.
- Set a schedule for how much you want to complete or review each week or month and stick to the schedule.
- It is a ton of material for which to prepare and you can try to be completely prepared for both parts or split. I focused mostly on the general exam first (though I took both) and passed general but missed the specialty by two questions! For the second try, I only had to take MolDx and passed with room to spare.
- Be sure to the memorize and pay attention to the General Knowledge (ABB) Examination content. This is the section that candidates have the most difficult time with due to the level of detail you are required to know.
- I used “Molecular Diagnostics” by Lela Buckingham to study, and that was the perfect reference. I just went chapter by chapter, making flash cards, and then took the practice tests. I did take the $500 prep course. I found it helpful to learn the material at a high level, but it was nowhere near specific enough.
- For the ABB General Knowledge exam, study all the materials they recommended once you register and receive their list, including CLIA requirements, OSHA and employment law.
- Know what study/learning tools work best for you and use them. Studying in groups can also be helpful for some.

- When studying for the molecular diagnostics exam, really focus on studying genetic diseases, molecular oncology and tissue typing methods which are the least routinely used in PHLs.
- Eat well and get plenty of rest before the exam day.
- For ABMM, try and find out what the focus of that year's exam will be or what it has been in prior years.
- Among other things, review/scan (within the last two or three years) all MMWR reports and Health Alert Advisories that comes out of CDC. This will give the most up to date information and an excellent picture of the major public health issues. Laboratory diagnostics—like specimen collection, storage, transport and testing methodologies—are all covered in these communications.
- Study case studies (ABMM) and memorize your CLIA personnel regulations (ABB) for all levels not just for high complexity laboratories.
- Yes, you are expected to be able to identify parasites from microscopic pictures.
- Know your NFPA or GHS symbols.
- Memorize the Labor Laws, how many employees qualify you for what laws and what the laws protect.
- Have co-workers, family or friends quiz you on materials once you have studied to truly test your knowledge or attend the Tuesday evening Boot Camp sessions.
- If you do not pass the first time, retry now that you know the depth of the exam and the types of questions asked and you will likely do MUCH better.
- ABMM, assess strengths and weaknesses and focus on your weakest areas and least knowledgeable areas first. This exam is also a bit more focused on clinical laboratory testing as compared to the testing performed in a public health laboratory.
- For ABB, don't allow the practice exam to mislead your level of understanding of the material. The actual exam is MUCH harder.
- For ABB, use the provided testing outline and percentages to determine where to focus your study time.
- For ABMM, sign up for a CPEP program if your schedule allows. If not, consider asking a clinical or hospital lab if you can attend rounds.
- For ABMM, review the study outline material provided and guide studying as suggested by the weighted sections.
- Ask to borrow reference books and reviews as opposed to buying them to reduce costs; many reference books only have a few sections that are relevant for studying
- For the ABB exam, the HCLD review section on general knowledge was more helpful than what could be purchased for the PHLD/Micro.
- Quizlet was a great resource to memorize information. There were quite a few card sets that were very helpful.
- The topics covered in the Boot Camp reviews are a great place to start reviewing topics.
- Do not to be discouraged if you do not pass the first time. It was very useful to see the types of questions that were asked and to review the areas based on the breakdown of the score that ABB provides (same for ABMM).

Qualifying

- If you want to direct a lab, two options are ABMM or ABB. You need four years of clinical lab experience, two directing/supervising high complexity testing and one year in a technical discipline. Once you have the time to prepare your application packet: Send transcript straight from your undergrad/grad schools to ABB. Online Application (bio), work summary—including all your clinical positions and CLIA number for lab—and I had my manager review it for accuracy. Current CV, list of papers published, awards received and your packet needs to be signed and notarized. Make sure your references have all of your documents in front of them, so they report the same dates of experience as you reported.

- I started this process in October 2022 and was scheduled to take it in May 2023, but life happened, and I had an extra six months to prepare. Your mileage may vary but I put in 5-10 hours/week studying with maybe pushing 15-20 hours the last couple weeks.
- I took ABB General Knowledge and Public Health Micro. For ABB Molecular, APHL is building up their Quizlet bank for Molecular, but I have been told that you will also want to invest in their course. I bought a bunch of stuff because I was terrified that there was a resource out there that I didn't have that would change everything for me. Items included: ABB General Study Guide, ABB Public Health Micro Study Guide, Bailey and Scott's Diagnostic Micro, Clinical Micro Made Ridiculously Simple, Lipincott's Microcards, Clinical Laboratory Management (wouldn't recommend this one though) and signed up for Brainscape to get more study cards (this will be less relevant as APHL builds a deeper Quizlet library).
- I forced myself to read the ABB study guides by typing them up into a document and printing them out as flashcards. I studied the micro textbooks every weekend for hours until I had a personal relationship with every single one on the list for the exam. I wrote out a list of mnemonics and practiced them regularly. This wasn't as helpful as I hoped. I listened to every episode of "This Podcast Will Kill You" with a microbe. This was very helpful. I made a YouTube playlist, but I am bad at watching things, so I mostly just referred to it when I didn't understand a testing algorithm.
- I participated in the APHL Boot Camp every week and used them as a way to structure my study schedule. In the beginning, as I ran into things I didn't understand I would dig deeper and write up summaries to refer back to. For the "Lab Math" sections (QA, stats, accounting), I ran through pages of practice problems, however some stuff is just brute force memorization: Shipping, Safety, CLIA Personnel Reqs, Labor Laws to name a few. Every night before sleep, I would spend half an hour to an hour going through the APHL Quizlet decks. This made my scores look great in the class, made me feel good about myself and was VERY helpful on the exam.

Sitting for the Exam

- In the end, I flew to New Orleans with both textbooks and a bunch of flash cards because I was terrified that I would want to review something and not have it. I showed up a day and a half early so I could see some sights, get some food, eight hours of studying and a good night's sleep. For some people, studying at the last minute might not help but I can think of four or five questions that I got right because I remembered the answers from the day before. In the exam room there is so much going on before you can write in the booklet that if you don't have it deep in your head, it's gone.
- My exam taking strategy was to write end to end answering what I could answering what I knew pretty fast and leaving what I didn't for later. After going through the whole booklet, I counted up what I knew for sure and then started putting in my best guesses. It's a two hour exam and by the one hour mark I was done and just working on my guessing. Everything bubbled in with 15 minutes to go and I had time to triple check my bubbles against the packet. I walked out knowing my guess rate which set a floor on my performance. I have heard that these exams have a 30% pass rate with some failing multiple times. However, I felt great about general and absolutely knew that if I took the micro exam again, I would pass.
    - General knew 56/70, 80% floor and I got 58 and needed 46.
    - Micro knew 42/70, 60% floor and I got 51 and needed 47.
- Hopefully, seeing my scores and hearing the details on my study process will help you pursue this certification and structure your preparations.
- I took ABMM and my advice is very specifically for people considering taking ABMM:
    - Consider applying for a CPEP fellowship (I understand that may not be possible for those already working in a lab that do not want to leave for a two year fellowship).
    - Attend the Clinical Microbiology Review Course (it used to be at ASM Microbe meeting but has changed to the PASCV meeting). Probably want to attend the year before you plan to take the exam rather than a few weeks before the exam period.
    - Look up exam information on ASM website.
    - Consider a rotation in a clinical lab for a few weeks—maybe could also do rounds with ID when at the clinical lab.

Abbreviation Glossary

AACC.....American Association of Clinical Chemistry

ABB.....American Board of Bioanalysis

ABCC.....American Board of Clinical Chemistry

ABFT.....American Board of Forensic Toxicology

ABMG.....American Board of Medical Genetics

ABMGG..American Board of Medical Genetics and Genomics

ABMLI....American Board of Medical Laboratory Immunology

ABMM....American Board of Medical Microbiology

ACHI.....American College of Histocompatibility and Immunogenetics

APHL.....Association of Public Health Laboratories

ARO.....Alternate Responsible Official

ASCP.....American Society of Clinical Pathologists

ASM.....American Society for Microbiology

AMP.....Association for Molecular Pathology

BMBL.....Biosafety in Microbiology and Biomedical Laboratories

CAP.....College of American Pathologists

CAPA.....Corrective and Preventive Action

CCM.....Canadian college of Microbiologists

CDC.....US Centers for Disease Control and Prevention

CE.....Continuing Education

CEU.....Continuing Education Units

CPEP.....ASM Committee on Post Graduate Educational Programs

CLIA.....Clinical Laboratory Improvement Amendment

CLMA.....Clinical Laboratory Management Association

CLSI.....Clinical Laboratory Standards Institute

CMS.....US Centers for Medicare and Medicaid Services

COLA.....Commission on Office Laboratory Accreditation

COOP.....Continuity of Operations Plan

CPT.....Current Procedural Terminology

CV.....Curriculum Vitae

DDS.....Doctor of Dental Surgery

DEA.....US Drug Enforcement Agency

DMLI.....Diplomate in Medical Laboratory Immunology

DNA.....Deoxyribonucleic Acid

DOT.....US Department of Transportation

DrPH.....Doctor of Public Health

DSc.....Doctor of Science

DVM.....Doctor of Veterinary Medicine

EIA.....Enzyme Immunoassay

ELISA.....Enzyme-linked Immunosorbent Assay

ETOR.....Electronic Lab Test Ordering and Result Reporting

EUA.....Emergency Use Authorization

FDA.....US Food and Drug Administration

FEMA.....Federal Emergency Management Agency

FIA.....Fluorescent Immunoassay

FOIA.....Freedom of Information Act

FSAP.....Federal Select Agent Program

GHS.....Global Harmonization System

GK.....General Knowledge (ABB Exam)

HCLD.....High-complexity Clinical Laboratory Director

HIE.....Health Information Exchange

HIPAA.....Health Insurance Portability and Accountability Act

HHS.....US Health and Human Services

IATA.....International Air Transportation Association

ICD ..... International Classification of Diseases

IQCP ..... Individualized Quality Control Plan

IRB ..... Institutional Review Board

ISO ..... International Organization for Standardization

KSA ..... Knowledge, Skills and Abilities

LDT ..... Laboratory Developed Test

LIMS ..... Laboratory Information Management System

LQMS ..... Quality Laboratory Management System

LOINC ..... Logical Observation Identifiers Names and Codes

NFPA ..... National Fire Protection Association

NGS ..... Next Generation Sequencing

NIH ..... US National Institutes of Health

NHANES ..... National Health and Nutrition Examination Survey

NPN ..... Non-protein Nitrogen

NPV ..... Negative Predictive Value

NRCC ..... National Registry of Certified Chemists

OSHA ..... US Occupational Safety and Health Administration

PhD ..... Doctor of Philosophy

PHI ..... Protected Health Information

PHL ..... Public health laboratory

PHLD ..... Public Health Laboratory Director

PI ..... Principal Investigator

PPE ..... Personal Protective Equipment

PPV ..... Positive Predictive Value

PPM ..... Provider Performed Microscopy

PRNT ..... Plaque Reduction and Neutralization Test/ Testing

PT ..... Proficiency Test

QC ..... Quality Control

RNA ..... Ribonucleic Acid

RO ..... Responsible Official

RUSP ..... Recommended Uniform Screening Panel

SDS ..... Safety Data Sheets

SNOMED ..... Systemized Nomenclature of Medicine

SNOMED-CT ... Systemized Nomenclature of Medicine—Clinical Terms

SOP ..... Standard Operating Procedure

TD ..... Technical Discipline (ABB Exam)

TQM ..... Total Quality Management

Contact Information

For more information or to provide feedback, contact the APHL Leadership programs at leadership@aphl.org.

Association of Public Health Laboratories

The Association of Public Health Laboratories (APHL) works to strengthen laboratory systems serving the public's health in the US and globally. APHL's member laboratories protect the public's health by monitoring and detecting infectious and foodborne diseases, environmental contaminants, terrorist agents, genetic disorders in newborns and other diverse health threats.

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