**Laboratory Quality Phases Across Clinical Laboratory Disciplines**

The MLT curriculum at HCC sequenced around the **total testing process**. **MLT 101** introduces students to all phases of testing, but the preanalytical and post-analytical phases are emphasized. The **core, discipline-specific courses** (Hematology, Clinical Chemistry, Immunology/Serology, Microbiology, Urinalysis/Body Fluids, and Immunohematology/Blood Bank) emphasize the analytical phase—methodology, instrumentation, and result integrity—specific to each department.

**Preanalytical and post-analytical focus in MLT 101.** Students master patient and specimen identification, order entry, labeling, phlebotomy basics, transport and temperature control, specimen accept/reject criteria, anticoagulants and tube selection, mixing, timing, and biosafety. They learn how these variables affect downstream validity (e.g., hemolysis, underfill, clots, delayed separation) Students practice the mechanics and judgment that turn numbers into actionable information: delta checks, critical-value policies with read-back, result comments and amendments, LIS documentation, provider communication, and hand-offs. Error recognition is practiced with discussion-based critical thinking/case study exercises.

**The core courses shift to analytical phase emphasis, while revisiting the preanalytical and post-analytical phases of testing.** After MLT 101, students enter rotations where the spotlight shifts to measurement science and method performance in each discipline. Error recognition is shifted from instructor-led discussion to more independent critical thinking/case study exercises.

**MLT 101 Intro to MLT**

**Pre-analytical:**

* Test ordering protocols and test utilization management
* Specimen tracking systems
* Patient preparation instructions
* Specimen rejection policies and documentation
* Special collection procedures

**Analytical:**

* Equipment maintenance schedules and documentation
* Quality control program design
* Regulatory agencies and compliance

**Post-analytical:**

* TAT monitoring
* Result reporting systems
* Corrected report procedures
* Continuing education and training programs
* Laboratory safety program (exposure control, chemical hygiene)

**MLT 110 Hematology/Hemostasis**

**Pre-analytical:**

* Proper anticoagulant selection: EDTA for CBC, sodium citrate for coagulation
* Tube fill requirements (9:1 blood-to-anticoagulant ratio for PT/PTT)
* Mixing immediately after collection to prevent clotting
* Time limits for specimen processing

**Analytical:**

* Daily calibration of hematology analyzers
* Running normal and abnormal controls
* Peripheral smear review and manual differentials for flagged samples
* Platelet count verification
* Morphology correlation with automated results

**Post-analytical:**

* Critical alert for panic values
* Therapeutic range monitoring for warfarin
* Result validation (delta checks) before release

**MLT 111 Immunology**

**Pre-analytical:**

* Serum vs. plasma requirements for specific assays
* Patient medication history (immunosuppressants affect results)
* Proper storage conditions

**Analytical:**

* ELISA plate washing and incubation timing
* Control sera at multiple levels
* Proficiency testing participation
* Confirmatory testing protocols
* Pattern recognition
* Prozone/post-zone

**Post-analytical:**

* Titer interpretation and reporting format
* Mandated and confidential reporting for infectious disease markers

**MLT 112 Clinical Chemistry**

**Pre-analytical:**

* Patient preparation: fasting requirements for glucose and lipid panels
* Proper specimen collection: SST tubes for metabolic panels, avoiding hemolysis
* Centrifugation timing and temperature control
* Sample stability considerations (glucose decreases 5-7% per hour at room temperature)

**Analytical:**

* Instrument calibration and quality control for automated chemistry analyzers
* Verification of linearity for analytes like creatinine, troponin
* Monitoring for interferences (lipemia, icterus, hemolysis)
* Reference interval establishment and validation
* Levey-Jennings chart and Westgard rule interpretation

**Post-analytical:**

* Critical value reporting protocols
* Delta checks to identify discrepant results
* Correlation with clinical findings
* Result interpretation considering reference intervals

**MLT 202 Clinical Microbiology & MLT 204 Mycology, Parasitology, & Virology**

**Pre-analytical:**

* Proper specimen collection
* Transport media selection
* Temperature and time requirements for specimens
* Specimen adequacy and rejection criteria

**Analytical:**

* Media quality control
* Biochemical test validation
* Antimicrobial susceptibility testing
* Incubation temperature and atmosphere verification
* Proficiency testing with unknown organisms
* Correlation with Gram stain and culture results

**Post-analytical:**

* Organism identification confirmation
* Antibiogram interpretation and reporting
* Critical pathogen notification
* Infection control communication

**MLT 203 Urinalysis & Body Fluid**

**Pre-analytical:**

* First morning void for routine urinalysis
* Proper container selection (sterile for culture, clean-catch technique)
* Time limitations (refrigerate if >2 hours delay)
* Body fluid collection in appropriate anticoagulants
* Volume requirements for cell counts and chemistry

**Analytical:**

* Reagent strip quality control daily
* Microscopic examination standardization (low/high power fields)
* Cell counting chambers for CSF and body fluids
* Correlation of chemical and microscopic findings
* Discrepancy investigation (positive blood, negative RBCs)
* Crystal identification and clinical significance
* CSF interpretation with paired serum glucose
* Body fluid classification (transudate vs. exudate)

**Post-analytical:**

* Critical communication for abnormal CSF findings

**MLT 205 Immunohematology/Transfusion Medicine**

**Pre-analytical:**

* Strict patient identification procedures (two identifiers)
* EDTA tubes for blood bank specimens
* Sample recollection requirements after transfusion
* Historical blood type review
* Proper labeling at bedside

**Analytical:**

* ABO/Rh typing with forward and reverse grouping
* Antibody screen using 3-cell panel
* Crossmatch procedures (immediate spin, AHG phase)
* Quality control of reagent red cells and antisera
* Investigation of ABO discrepancies
* Antibody identification and clinical significance determination
* DAT (Direct Antiglobulin Test) for hemolytic workups

**Post-analytical:**

* Type and screen result verification with historical records
* Blood product selection and compatibility documentation
* Transfusion reaction investigation protocols