

## Doisy College of Health Sciences Program-Level Assessment: Annual Report

Program: Medical Laboratory Science

Department: Clinical Health Sciences

Degree or Certificate Level: BS and Certificate

College/School: Doisy College of Health Sciences

Date (Month/Year): 8/25/2020

Primary Assessment Contact: amanda.reed@health.slu.edu

In what year/cycle was the data upon which this report is based collected? 2019-2020

In what year/cycle was the program's assessment plan most recently reviewed/updated? 2018-2019

### 1. Student Learning Outcomes

Which of the program's student learning outcomes were assessed in this annual assessment cycle?

**PLO #2:** Students will communicate accurate laboratory information to members of the healthcare team.

**PLO #4:** Students will demonstrate the application of laboratory principles.

### 2. Assessment Methods: Student Artifacts

Which student artifacts were used to determine if students achieved this outcome? Please identify the course(s) in which these artifacts were collected. Clarify if any such courses were offered a) online, b) at the Madrid campus, or c) at any other off-campus location.

**PLO #2:** Students will communicate accurate laboratory information to members of the healthcare team.

**Artifact 1- MLS 4550 Medical Bacteriology Laboratory** / Laboratory report forms (Due to COVID-19, this course transitioned to online starting March 2020)

**Artifact 2- MLS-4800 Clinical Microbiology Practicum** / Professional Development Evaluation (This is a clinical course that takes place at hospital microbiology labs throughout the St. Louis metropolitan area).

No Madrid student artifacts were included.

**PLO #4:** Students will demonstrate the application of laboratory principles.

**Artifact-1- BLS 1150 Foundations of Medical Laboratory Science Laboratory** / Hematology Laboratory exercise.

**Artifact-2- MLS 4740 Clinical Hematology** / Work Skills Evaluation (This is a clinical course that takes place at hospital microbiology labs throughout the St. Louis metropolitan area).

No Madrid student artifacts were included.

### 3. Assessment Methods: Evaluation Process

What process was used to evaluate the student artifacts, and by whom? Please identify the tools(s) (e.g., a rubric) used in the process and include them in/with this report.

**PLO #2:** Students will communicate accurate laboratory information to members of the healthcare team.

**Artifact 1- MLS 4550 Medical Bacteriology Laboratory / Laboratory report forms (n = 7)**

Due to COVID-19 and the transition to online learning in March of 2020, this assignment was not assigned. This report form is usually the last of the bacteriology unknowns and is presented in a case study format. Students are asked to use patient history, symptoms, and clinical findings to identify the causative agent of the patient's infection (using established laboratory procedures) and report the findings. This is done by either calling panic values to the physician caring for the patient (who is one of our faculty members) or simply issuing a report for non-panic values. It is graded by the course instructor and assigned a grade out of 20 points. The Program Director uses the assessment rubric located in the appendix to evaluate the laboratory report forms, however, the assignments were not given due to the switch to online learning.

**Artifact 2- MLS-4800 Clinical Microbiology Practicum / Professional Development Evaluation (n= 7)**

(This is a clinical course that takes place at hospital microbiology labs throughout the St. Louis metropolitan area).

This PLO is actually measured on the MLS 4800 Clinical Microbiology Work Skills evaluation form, not the Professional Development form. The forms were completed by the Clinical Preceptors at the end of the students' clinical rotation and were then evaluated by the MLS Program Director. The Clinical Preceptor ranked the students on a scale of 1 to 5 (5 being the highest score) on various skills/tasks that are linked to our specific MLS program goals and PLOs. The MLS Program Director used the assessment rubric located in the appendix to review the scores of the respective skills/tasks. The Program Director identified students scoring 4 or 5 as achieving the ranking of "master" since, per the evaluation form, the student met the "level of competency required by the laboratory for that task or process." The Program Director identified students scoring a 3 as achieving the ranking of "reinforce" and scoring a 1 or 2 as "introduced".

**LEVEL 1:** Discussed: Process was discussed, principle explained, and the **student acknowledged an understanding** of the process or principle.

**LEVEL 2:** Demonstrated: Process has been performed and demonstrated by the practicum instructor. Student has observed the demonstration and has been allowed to ask questions as needed. The **student acknowledges an understanding** of the process or principle by verbally explaining the process or principle back to the practicum instructor.

**LEVEL 3:** Practiced: Student has practiced the process under the direction and maximum supervision of the practicum instructor. The student demonstrates a knowledge of how to perform the process or task by actual performance under direct, maximum supervision, but **without having to demonstrate any competency** at that task or process.

**LEVEL 4:** Maximum Supervision: The student has performed the process under the direct, maximum supervision of the practicum instructor, and with the **level of competency required by the laboratory for that task or process**.

**LEVEL 5:** Minimum Supervision: The student can perform the process satisfactorily with only minimum, or non-direct supervision by the practicum instructor, and the performance meets the **level of competency required by the laboratory for that task or process**.

**N/A:** Not Available/Applicable: Due to the nature of the laboratory, the student does not have access to the

equipment/test method.

**PLO #4:** Students will demonstrate the application of laboratory principles. (n = 9)

**Artifact-1- BLS 1150** Foundations of Medical Laboratory Science Laboratory / Hematology Laboratory exercise.

The hematology laboratory exercise was reviewed by the MLS Program Director. The Program Director used the assessment rubric located in the appendix to evaluate each assignment. The results were tallied and the Program Director determined the % of students that achieved a ranking of “introduce” or higher on the assessment rubric

**Artifact-2- MLS 4740** Clinical Hematology Work Skills Evaluation (n=8)

The forms were completed by the Clinical Preceptors at the end of the students’ clinical rotation and were then evaluated by the MLS Program Director. The Clinical Preceptor ranked the students on a scale of 1 to 5 (5 being the highest score) on various skills/tasks that are linked to our specific MLS program goals and PLOs. The MLS Program Director used the assessment rubric located in the appendix to review the scores of the respective skills/tasks. The Program Director identified students scoring 4 or 5 as achieving the ranking of “master” since, per the evaluation form, the student met the “level of competency required by the laboratory for that task or process.” The Program Director identified students scoring a 3 as achieving the ranking of “reinforce” and scoring a 1 or 2 as “introduced”.

**LEVEL 1: Discussed:** Process was discussed, principle explained, and the **student acknowledged an understanding** of the process or principle.

**LEVEL 2: Demonstrated:** Process has been performed and demonstrated by the practicum instructor. Student has observed the demonstration and has been allowed to ask questions as needed. The student **acknowledges an understanding** of the process or principle by verbally explaining the process or principle back to the practicum instructor.

**LEVEL 3: Practiced:** Student has practiced the process under the direction and maximum supervision of the practicum instructor. The student demonstrates a knowledge of how to perform the process or task by actual performance under direct, maximum supervision, but **without having to demonstrate any competency** at that task or process.

**LEVEL 4: Maximum Supervision:** The student has performed the process under the direct, maximum supervision of the practicum instructor, and with the **level of competency required by the laboratory for that task or process**.

**LEVEL 5: Minimum Supervision:** The student can perform the process satisfactorily with only minimum, or non-direct supervision by the practicum instructor, and the performance meets the **level of competency required by the laboratory for that task or process**.

**N/A: Not Available/Applicable:** Due to the nature of the laboratory, the student does not have access to the equipment/test method.

#### 4. Data/Results

What were the results of the assessment of the learning outcomes? Please be specific. Does achievement differ by teaching modality (e.g., online vs. face-to-face) or on-ground location (e.g., STL campus, Madrid campus, other off-campus site)?

**PLO #2:** Students will communicate accurate laboratory information to members of the healthcare team.

**Artifact 1- MLS 4550 Medical Bacteriology Laboratory** / Laboratory report forms (Due to COVID-19, this course transitioned to online starting March 2020)

Unable to evaluate data due to the switch from in seat to online learning in the spring of 2020. This assignment was not assigned.

**Artifact 2- MLS-4800 Clinical Microbiology Practicum** / Professional Development Evaluation (This is a clinical course that takes place at hospital microbiology labs throughout the St. Louis metropolitan area).

This PLO is measured on the MLS 4800 Clinical Microbiology Work Skills evaluation form, not the Professional Development form. 86% (6/7) of the students achieved a ranking of “mastery” while 14% (1/7) earned a ranking of “reinforce”, meaning 86% of the students were able to “assess panic values and correctly notify appropriate personnel with documentation.

14% of the students were able to “evaluate” information to prepare preliminary and final reports using established protocols with minimal error but had trouble with the mastery criteria. This student earned a score of a 3/10 from their clinical instructors. Per the instructions on the Work Skills evaluation form, a score of 3 indicates, “Student has practiced the process under the direction and maximum supervision of the practicum instructor. The student demonstrates a knowledge of how to perform the process or task by actual performance under direct, maximum supervision, but **without having to demonstrate any competency at that task or process.**”

Teaching modality did not differ for this artifact. All students were assessed at off campus locations as part of their clinical practicums.

**PLO #4:** Students will demonstrate the application of laboratory principles.

**Artifact-1- BLS 1150 Foundations of Medical Laboratory Science Laboratory** / Hematology Laboratory exercise.

An average of 100% (9/9) of students achieved a ranking of “introduce” or higher using corresponding assessment rubric. Students were able to “follow workflow protocol utilizing procedures/operating manuals and/or verbal direction from the instructor.”

Teaching modality did not differ for this artifact. All students completed this exercise in an in-seat learning environment.

**Artifact-2- MLS 4740 Clinical Hematology Work Skills Evaluation**

**75% (6/8)** of the students earned a ranking “mastery” while 12.5% (1/8) earned a ranking of “reinforce” and 12.5% (1/8) earned a ranking of “introduce”. Meaning 75% of the students could “evaluate pre-analytical, analytical, and post-analytical laboratory processes alongside the patient’s reported physiology condition to assess the reliability of results.” 12.5% of the students were able to “interpret laboratory results”, and 12.5% were able to follow workflow protocol to utilizing procedures/operating manuals, and/or verbal directions from the instructor.”

Teaching modality did not differ for this artifact. All students were assessed at off campus locations as part of their

## 5. Findings: Interpretations & Conclusions

What have you learned from these results? What does the data tell you?

**PLO #2:** Students will communicate accurate laboratory information to members of the healthcare team.

**Artifact 1- MLS 4550 Medical Bacteriology Laboratory** / Laboratory report forms (Due to COVID-19, this course transitioned to online starting March 2020)

PLO #2 is assessed every academic year ending in an even number. Since no data for the artifact was collected, it must be analyzed during the AY21/22.

**Artifact 2- MLS-4800 Clinical Microbiology Practicum** / Professional Development Evaluation (This is a clinical course that takes place at hospital microbiology labs throughout the St. Louis metropolitan area).

This PLO is measured on the MLS 4800 Clinical Microbiology Work Skills evaluation form, not the Professional Development form. Therefore, the Academic Program Assessment Plan will be appropriately updated.

Upon review of the evaluation forms, it became evident that not all Clinical Preceptors allowed students to issue official results or notify the appropriate physician/nurse. Therefore, the students who earned the “reinforce” ranking was marked lower than his/her peers since he/she was not given the opportunity to practice this competency under minimum supervision. The evaluation form will be updated to better reflect that these competencies can be performed under a mock or artificial setting and that all students should have the opportunity to achieve mastery.

In addition, students were issued one score even though they were being evaluated on multiple competencies. The form will be revised so that each competency is associated with its own score. The evaluation forms also need to be updated to better reflect the Program Assessment Rubric criteria.

The evaluation forms need to be updated and additional assessment cycles are needed to determine whether changes are needed.

**PLO #4:** Students will demonstrate the application of laboratory principles.

**Artifact-1- BLS 1150 Foundations of Medical Laboratory Science Laboratory** / Hematology Laboratory exercise.

Upon review of the Hematology exercise, it was clear that the laboratory activity is useful for determining whether the students meet the “introduce” criteria but is not necessarily useful for determining “reinforce” or “mastery”. The assignment has since been revised to better reflect all levels of competency.

**Artifact-2- MLS 4740 Clinical Hematology Work Skills Evaluation**

The evaluation form used to evaluate PLO #4 is the same evaluation form that is used to evaluate PLO #2. Similar problems occurred as described above. It appears that some Clinical Preceptors took the wording very literally and marked students off because technically, the student were not allowed to “issue patient results”. Again, the form needs to be revised to ensure they Clinical Preceptors understand that fake patient samples can be used and results can be “issued” and called to the physician or nurse in a mock environment.

In addition, students were issued one score even though they were being evaluated on multiple competencies. The form will be revised so that each competency is associated with its own score.

The evaluation forms also need to be updated to better reflect the Program Assessment Rubric criteria.

The evaluation forms need to be updated and additional assessment cycles are needed to determine whether changes are needed.

## 6. Closing the Loop: Dissemination and Use of Current Assessment Findings

A. When and how did your program faculty share and discuss these results and findings from this cycle of assessment?

These results will be shared and discussed at the fall 2020 MLS faculty meeting.

B. How specifically have you decided to use findings to improve teaching and learning in your program? For example, perhaps you've initiated one or more of the following:

Changes to the Curriculum or Pedagogies	<ul style="list-style-type: none"><li>• Course content</li><li>• Teaching techniques</li><li>• Improvements in technology</li><li>• Prerequisites</li></ul>	<ul style="list-style-type: none"><li>• Course sequence</li><li>• New courses</li><li>• Deletion of courses</li><li>• Changes in frequency or scheduling of course offerings</li></ul>
Changes to the Assessment Plan	<ul style="list-style-type: none"><li>• Student learning outcomes</li><li>• Student artifacts collected</li><li>• Evaluation process</li></ul>	<ul style="list-style-type: none"><li>• Evaluation tools (e.g., rubrics)</li><li>• Data collection methods</li><li>• Frequency of data collection</li></ul>

Please describe the actions you are taking as a result of the findings.

The assessment plan will be updated to reflect that the Work Skills evaluation form was used to evaluate PLO#2 and not the Professional Development evaluation form. The Work Skills evaluation forms that are used to assess PLO #2 and PLO #4 need clarification and reformatting so that students are evaluated equally regardless of the site of their clinical rotation.

The Hematology Laboratory Assignment has been updated to better evaluate the “reinforce” and “mastery” criteria outlined in the corresponding Program Assessment Rubric.

If no changes are being made, please explain why.

## 7. Closing the Loop: Review of Previous Assessment Findings and Changes

A. What is at least one change your program has implemented in recent years as a result of assessment data?

NA. We have not yet had enough consistent evaluation methods or continuous assessment cycles to make any meaningful determinations from the assessment data.

B. How has this change/have these changes been assessed?

NA

C. What were the findings of the assessment?

NA

D. How do you plan to (continue to) use this information moving forward?

NA

**IMPORTANT: Please submit any assessment tools and/or revised/updated assessment plans along with this report.**

### ASSESSMENT TOOLS

**PLO #2:** Students will communicate accurate laboratory information to members of the healthcare team.

**Artifact 1 for PLO#2:** NA since this assessment was canceled due to the transition to online learning during the COVID-19 Pandemic.

**Artifact 2- MLS-4800 Clinical Microbiology Practicum / Work Skills Evaluation**

### SECTION I: WORK SKILLS EVALUATION (MICROBIOLOGY)

At the completion of MLS 4800 Clinical Microbiology Practicum, the student will have successfully completed the following:

1. Perform microbiology analyses with good technique, carefully with attention to detail and quality.
2. Maintain and operate equipment and instrumentation reliably; generate quality results.
3. Leave work area, equipment and instrumentation clear and in good working order after use.
4. Organize for priority and efficiency.
5. Strictly follow written procedures and verbal instructions.
6. Use proper quality control measures.
7. Adhere to confidentiality policies.
8. Demonstrate initiative and resourcefulness; learn more than the minimum.
9. Exhibit a professional appearance and attitude.
10. **Communicate with instructors, other healthcare professionals, and patients in a clear professional way.**

Students will collaborate with their instructors to complete the listed objectives. Accuracy, precision, timely reporting of test results, and demeanor will comply with the laboratory's standards. Students will further meet the laboratory standards for work habit skills, patient confidentiality, safety, waste disposal, and work area maintenance.

Students should make every effort to observe or participate in performing the following rarely performed tests. Performance and/or observations of all competencies should be documented with the date and initials of the instructor.

**Students must achieve an 80% score in the practical rotation.**

**Instructors: Please adjust "Goals" and numbers of tests to fit your institution's workload, situation, and your convictions of what is satisfactory proficiency for your laboratory situation.**

# MLS 4800: CLINICAL MICROBIOLOGY PRACTICUM

## LEVELS OF ACHIEVEMENT

**LEVEL 1:** Discussed: Process was discussed, principle explained, and the student acknowledged an understanding of the process or principle.

**LEVEL 2:** Demonstrated: Process has been performed and demonstrated by the practicum instructor. Student has observed the demonstration and has been allowed to ask questions as needed. The student acknowledges an understanding of the process or principle by verbally explaining the process or principle back to the practicum instructor.

**LEVEL 3:** Practiced: Student has practiced the process under the direction and maximum supervision of the practicum instructor. The student demonstrates a knowledge of how to perform the process or task by actual performance under direct, maximum supervision, but without having to demonstrate any particular competency at that task or process.

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**LEVEL 5:** Minimum Supervision: The student can perform the process satisfactorily with only minimum, or non-direct supervision by the practicum instructor, and the performance meets the level of competency required by the laboratory for that task or process.

**N/A:** Not Available/Applicable: Due to the nature of the laboratory, the student does not have access to the equipment/test method.

OBJECTIVE	EARNED SCORE	N/A	INSTRUCTOR INITIALS	DATE
<b>Safety</b> <ul style="list-style-type: none"> <li>• Use biohazardous hood during all applicable situations</li> <li>• Wear proper PPE during all applicable situations</li> <li>• Dispose of biohazards, reagents and chemicals in designated containers</li> <li>• Follow all affiliate site safety directives</li> </ul>				
<b>Specimen processing and handling:</b> <ul style="list-style-type: none"> <li>• Accepts into the laboratory appropriate and correctly labeled specimens for testing and culture</li> <li>• Takes appropriate action if specimen is unacceptable</li> <li>• Correctly processes specimens for testing</li> <li>• Maintains sample identity and worksheet documentation throughout processing</li> <li>• Initial streaking or plating of specimens correctly performed using proper media per protocol</li> </ul>				
<b>QC: Participate in quality control and maintenance practices.</b> <ul style="list-style-type: none"> <li>• Runs QC as directed, and correctly interprets results</li> <li>• Performs and documents daily and/or weekly maintenance</li> <li>• Monitor incubators, heat blocks, refrigerators, etc.</li> </ul>				



<ul style="list-style-type: none"> <li>Properly labels reagents</li> <li>Recognizes QC failure and notifies trained personnel</li> <li>Check media and reagent expiration dates</li> <li>Verify kits perform as they should or reagents react appropriately</li> </ul>				
<b>Instrumentation operation:</b> <ul style="list-style-type: none"> <li>Follows written/verbal directions for instrument operation</li> <li>Organizes and prioritizes workload</li> <li>Recognizes basic instrument problems and notifies trained personnel if necessary</li> <li>Monitors reagent levels and changes as needed</li> </ul>				
<b>Interpretation and Reporting:</b> <ul style="list-style-type: none"> <li>Identifies valid results and can spot inconsistencies or questionable ones</li> <li>Identifies panic values and notifies trained personnel</li> <li>Identifies possible sources of error and initiates resolution</li> <li>Reports results without error</li> <li>Handles documents, record-keeping, and reports per policy</li> </ul>				
<b>OBJECTIVE</b>	<b>EARNED SCORE</b>	<b>N/A</b>	<b>INSTRUCTOR INITIALS</b>	<b>DATE</b>
<b>Smear Preparation and Interpretation</b> <ul style="list-style-type: none"> <li>Perform the gram stain procedure successfully</li> <li>Evaluate correctly the reaction and morphology of organisms and cells</li> <li>Properly quantify stained smears when appropriate</li> <li>Properly evaluate stained smears for quality</li> </ul>				
<b>ORGANISM IDENTIFICATION – <u>MUST</u> be able to identify the organisms in bold</b>				
Correctly correlate gram stain results with growth on culture media Recognize colony characteristics of bacteria from one media to another Correctly correlate growth on culture media and growth conditions with bacterial identifications Secondary culture: Correctly isolates and subcultures Select, perform and interpret preliminary and confirmatory biochemical tests for identification Document workups and decisions clearly, legibly, and concisely <b>per your institutions procedures.</b>				
<i>Staphylococcus aureus</i>				
<i>Staphylococcus epidermidis</i>				
<i>Staphylococcus lugdunensis</i>				
<i>Other coagulase negative Staphylococcus</i>				
<i>Micrococcus spp.</i>				
<i>Streptococcus agalactiae</i>				
<i>Streptococcus anginosus</i>				
<i>Streptococcus pyogenes</i>				
<i>Streptococcus pneumoniae</i>				
<i>Enterococcus spp.</i>				
<i>Haemophilus sp.</i>				
<i>Neisseria gonorrhoeae</i>				
<i>Neisseria meningitidis</i>				
<i>Moraxella catarrhalis</i>				
<i>Enterobacteriaceae (including common gastrointestinal pathogens)</i>				
<i>Campylobacter jejuni.</i>				
<i>Pseudomonas aeruginosa</i>				
<i>Vibrio spp.</i>				
<i>Stenotrophomonas maltophilia</i>				
<i>Acinetobacter spp.</i>				

<i>Burkholderia spp.</i>				
<i>Gardnerella vaginalis</i>				
<b><i>Corynebacterium spp.</i></b>				
<b><i>Listeria monocytogenes</i></b>				
HACEK and other fastidious gram negative rods				
<i>Pasteurella multocida</i>				
<i>Legionella pneumophila</i>				
<i>Capnocytophaga spp.</i>				
<i>Nocardia</i>				
<b><i>Clostridium perfringens</i></b>				
<i>Clostridium difficile</i>				
<i>Clostridium septicum</i>				
<b><i>Propionibacterium (Cutibacteria) acnes</i></b>				
<i>Actinomyces</i>				
<i>Lactobacillus</i>				
<b>OBJECTIVE</b>	<b>EARNED SCORE</b>	<b>N/A</b>	<b>INSTRUCTOR INITIALS</b>	<b>DATE</b>
<i>Fusobacterium</i>				
<b><i>Bacteroides fragilis/fragilis group</i></b>				
<i>Prevotella spp.</i>				
<i>Veillonella spp.</i>				
<i>Porphyromonas spp.</i>				
<b><i>Candida albicans</i></b>				
Potential bioterrorism organisms				
<b>CULTURE INTERPRETATION- MLS students will demonstrate skill at interpreting the following types of cultures under supervision.</b>				
Distinguishes normal flora or contaminants from pathogens in properly incubated cultures Quantitates accurately Performs identifications and susceptibilities when appropriate Documents work clearly and legibly				
Respiratory				
Urine				
Wound/Tissue				
Body Fluid				
Stool				
Blood/Sterile				
Anaerobe				
<b>SUSCEPTIBILITY TESTING</b>				
<ul style="list-style-type: none"> <li>Correctly performs Kirby-Bauer susceptibility testing, special resistance detection methods, and interprets zone sizes according to NCCLS' standards. Be sure to include the following: <ul style="list-style-type: none"> <li>Oxacillin resistance for <i>S. aureus</i></li> <li>Inducible clindamycin resistance for <i>S. aureus</i>, beta-hemolytic <i>Streptococcus spp.</i>, and <i>S. pneumoniae</i></li> <li>Vancomycin resistance for <i>Enterococcus</i> and <i>Staphylococcus spp.</i></li> <li>High-level aminoglycoside resistance for <i>Enterococcus spp.</i></li> <li>Penicillin resistance for <i>S. pneumoniae</i></li> <li>ESBL for <i>Enterobacteriaceae</i></li> <li>ampC enzymes for gram negative rods</li> <li>Carbapenemase resistant <i>Enterobacteriaceae</i> (CRE)</li> </ul> </li> </ul>				

• Correctly performs E-test testing and interprets zone sizes according to NCCLS' standards					
• Correctly performs and interpret MIC testing (micro-broth and/or automated systems.					
• Correctly performs and interprets molecular detection of resistance.					
• Correctly recognizes classic antibiotic patterns that organisms ordinarily display					
• Correctly recognizes multidrug resistant organisms					
• Correctly uses and interprets Beta-lactamase testing					
• Recognizes antibiotic inconsistencies or unusual patterns					
• Performs appropriate quality control					
<b>IMMUNOLOGICAL METHODOLOGY</b>					
• Correctly performs and interprets latex agglutinations/hemagglutination					
• Correctly performs and interprets results of ELISA/EIA tests					
• Correlates results with other clinical observations or results.					
• Recognizes sources of error					
<b>TOTAL NUMBER OF COMPETENCIES MET: /325</b>					
(Passing score is ≥80%)					

The following tests may be performed at some clinical affiliates. Instructors, please document if students have observed and/or performed these tests:

Acridine Orange	_____	Methylene Blue Fecal Leukocyte Stain	_____
Calcofluor White	_____	Slide culture	_____
Fungal Culture Interpretation	_____	Tease Mount	_____
Anaerobe identification	_____	Yeast assimilations	_____
MRSA Confirmation (MHOX or CFX)	_____	Saline/Iodine Stool Wet Preps	_____
Vancomycin Screen (BHI Vanc)	_____	Malaria smears (thick and thin)	_____
Acid-Fast Smears (Carbol fuchsin)	_____	Other stains for parasites	_____
Acid-Fast Smears (fluorochrome)	_____	Modified Acid Fast	_____
ELISA for Giardia/Cryptosporidium	_____	Work up of positive AFB cultures	_____
Bacterial Antigen Detection (CSF)	_____	Chlamydia DFA	_____
Blood Culture for AFB	_____	Other	_____
Processing specimens for AFB	_____		

<b>Discipline</b>	<b>Instruments Utilized to Evaluate Work Practice Skills</b>
Automated Instrumentation for processing and plating of specimens	
Automated Instrumentation for ID of organisms (MALDI, Vitek, etc)	
Automated Immunoassay Instrumentation	
Blood Culture Instrumentation	
Molecular Instrumentation	
Automated susceptibility instrumentation	
Other	

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Comments:

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#### Assessment Tool for PLO #2:

MEDICAL LABORATORY SCIENCE (MLS)		
Program Learning Outcome (PLO #2): Students will communicate accurate laboratory information to members of the healthcare team.		
Introduce**	Reinforce**	Master**
<ul style="list-style-type: none"> <li>Documents the following data for <b>EACH</b> isolated organism with minimal error:               <ul style="list-style-type: none"> <li>Colony morphology on agar</li> <li>Stain results of isolated microbe</li> <li>Selective and differential media reactions.</li> <li>Biochemical tests performed and their reactions.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Evaluate the above information to prepare preliminary and final reports using established laboratory protocols with minimal error.</li> </ul>	<ul style="list-style-type: none"> <li>Assess panic values and correctly notifies appropriate personnel with documentation.</li> </ul>

**\*\*IMPORTANT NOTES:** The ratings, identified by the column headings, are of increasing complexity moving across the table (from left to right). Students who can interpret information presented in laboratory-based case study problems (that is, meet the “reinforce” rating) must be able to first identify the problem (the “introduce” rating). Likewise, in order for students to propose solutions (the “master” rating), they must identify the problem (introduce) and interpret pertinent information (“reinforce” rating).

**PLO #4:** Students will demonstrate the application of laboratory principles.

**Artifact-1- BLS 1150 Foundations of Medical Laboratory Science Laboratory / Hematology Laboratory exercise.**

### LAB MODULE #5: MODIFIED HEMATOLOGY PROCEDURE

HEMATOLOGY LABORATORY OBJECTIVES:

By the end of this module, students will be able to:

1. Discuss the 3 parts of the manual differential.
2. Assess the "counting area" on a peripheral blood smear.
3. Perform a modified white blood cell count and platelet count.
4. Calculate the results of a modified white blood cell count and platelet count.
5. Interpret the results of a modified white blood cell count.
6. Formulate a presumptive diagnosis based upon the results of a modified white blood cell count.

#### OVERVIEW OF EXAMINATION OF PERIPHERAL BLOOD SMEAR:

More information can be obtained from a detailed examination of a stained blood smear than from just about any other single laboratory test. A peripheral blood smear is made by spreading a drop of blood on a slide to produce one layer of cells with a "feathered" edge (see Figure below). The slide is stained with a Wright's stain to better visualize the cells and to aid in differentiating the types of white blood cells. The slide is read using a microscope on oil immersion. The 3 parts of a manual differential are:

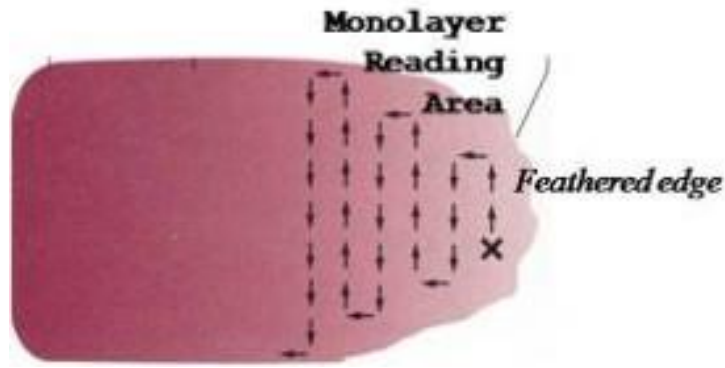
- White blood cell (WBC) count – the number of WBC and differentiated by type. This part of the test screens for a wide range of diseases and conditions, such as leukemia.
- Red blood cell (RBC) morphology – size, shape, and/or color. Screens for a variety of disorders such as anemia.
- Platelets – size, shape, granulation, and estimate of #. Screens for platelet abnormalities (giant platelets, hypogranular platelets) or an abnormal increase or decrease in number which can be indicative of a variety of diseases.

#### PERFORM A MODIFIED DIFFERENTIAL WHITE BLOOD CELL COUNT:

The 6 normal WBCs can be differentiated based on certain characteristics involving the size, nucleus, and cytoplasm of the cell, and then the percentage of each type of white blood cell can be determined. Differential testing can often suggest the patient's diagnosis.

NOTE: For this lab, the microscope has already been focused on oil immersion. **DO NOT change the objective!!!** The best location to view the cells is in the monolayer or thin area, where the RBCs are just touching. Reading outside this area will affect cell differential counts and morphology.

1. Move the slide to the monolayer or thin area indicated by the jagged arrow (see Figure below). Let an instructor help you locate the correct field before counting.
2. Identify each WBC seen in the microscopic field and record using the differential cell counter.
3. Once you have counted all the WBCs in one field, go to the next microscopic field, and continue counting the white blood cells. When counting WBCs, move the slide up, over, down, over, etc. as shown in the figure below.
4. Count a total of 25 white blood cells and record on the attached "Hematology Laboratory Worksheet". Then calculate % of each type of WBC.



**PERFORM A PLATELET ESTIMATION:**

Platelets are examined for changes in size, shape, and/or granulation, and to estimate the platelet count.

1. Examine the platelets in the monolayer or thin area of the slide.
2. Count the number of platelets in 1 field and record on the attached worksheet.
3. Then multiply this number by 20,000 to estimate the patient's platelet count.

**WEEK 7: HEMATOLOGY LABORATORY WORKSHEET**

Name: \_\_\_\_\_ Score: \_\_\_\_/15

Place the Slide Letter here: \_\_\_\_\_

Fill in the table below by performing a white blood cell differential on 25 WBCs and calculating the percentage of each cell type. (6 pts.)

WHITE BLOOD CELL TYPE	# OF CELLS COUNTED	% CALCULATED (# COUNTED X 4 = %)	NORMAL REFERENCE RANGE	INTERPRETATION (High, Normal, Low)	CORRELATION WITH % AS SHOWN ON THE BOARD
1. SEGMENTED NEUTROPHIL			50-65%		
2. BAND NEUTROPHIL			0-6%		
3. LYMPHOCYTE			20-40%		
4. MONOCYTE			4-10%		
5. EOSINOPHIL			1-3%		
6. BASOPHIL			0-1%		

<b>TOTAL</b>	<b>25</b>	<b>25 x 4 = 100%</b>			
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7. Do your WBC differential counts for each cell type match the counts written on the board by  $\pm 2\%$ ? (0.5 points)

Perform platelet estimation in the thin area of slide where the RBCs barely touch.

8. Platelets counted/field: # \_\_\_\_\_ X 20,000 = \_\_\_\_\_ /mm<sup>3</sup> (0.5 points)

9. Do your platelet counts correlate with the counts written on the board by  $\pm 2\%$ ? (0.5 points)

10. If your WBC differential count and platelet count do not correlate with the % shown on the board, list two ways to correct the discrepancy: (0.5 points)

- 
- 

11. Based upon your results, would you be able to report out the results? (0.25 points)

12. Based upon your results, what might your patient be suffering from? (0.25 points)

**MATCHING:** Match the white blood cell type on the left with the description that fits it best from the right. (5 pts.) (Obj., tax I)

- |                      |   |
|----------------------|---|
| _____ 13. Neutrophil | A. Smallest WBC and has no granules                       |
| _____ 14. Basophil   | B. Largest WBC with a bi-lobed nucleus                    |
| _____ 15. Lymphocyte | C. WBC contains large purple or black granules            |
| _____ 16. Monocyte   | D. WBC contains large orange-red granules                 |
| _____ 17. Eosinophil | E. WBC contains multi-lobed nucleus & small pink granules |

\_\_\_\_\_ 18. What type of stain is used to better visualize the cells and to aid in differentiating the types of white blood cells? (0.5 points)

- A. Calcofluor white stain
- B. Gram stain
- C. Kova stain
- D. Wright's stain

- \_\_\_\_\_ 19. Manual white blood cell differentials are performed using the \_\_\_\_\_ objective lens. (0.5 points)
- A. 4X
  - B. 10X
  - C. 40x
  - D. 100X
- \_\_\_\_\_ 20. Manual platelet counts are performed using the \_\_\_\_\_ objective lens. (0.5 points)
- A. 4X
  - B. 10X
  - C. 40x
  - D. 100X

**Artifact-2- MLS 4740 Clinical Hematology / Work Skills Evaluation**

**SECTION I: WORK SKILLS EVALUATION**

At the completion of MLS 4740 Clinical Hematology Practicum, the student will have successfully completed the following:

1. Perform hematological testing with good technique, paying attention to detail and quality.
2. Maintain and operate instrumentation reliably and generate quality results.
3. Strictly adhere to written procedures and accept verbal technical direction.
4. Use proper quality control measures.
5. Treat laboratory results and issues confidentially.
6. Maintain technical competency and emotional stability in times of stress or tension.
7. Initiate learning new techniques and demonstrate persistence in developing skills.
8. Communicate legibly on paper.
9. Practice safety at all times.
10. Communicate confidently with other professionals, students and patients.
11. Organize for priority and efficiency.
12. Recognize unusual or abnormal results and consult an experienced technologist.

Students will collaborate with their instructors to complete the listed objectives. Accuracy, precision, timely reporting of test results, and demeanor will comply with the laboratory's standards. Students will further meet the laboratory standards for work habit skills, patient confidentiality, safety, waste disposal, and work area maintenance.

Students should make every effort to observe or participate in performing the following rarely performed tests. Performance and/or observations of all competencies should be documented with the date and initials of the instructor.



Students must achieve an 80% score in the practical rotation.

Instructors: Please adjust “Goals” and numbers of tests to fit your institution’s workload, situation, and your convictions of what is satisfactory proficiency for your laboratory situation.

## MLS 4740: CLINICAL HEMATOLOGY PRACTICUM

### LEVELS OF ACHIEVEMENT

**LEVEL 1:** Discussed: Process was discussed, principle explained, and the student acknowledged an understanding of the process or principle.

**LEVEL 2:** Demonstrated: Process has been performed and demonstrated by the practicum instructor. Student has observed the demonstration and has been allowed to ask questions as needed. The student acknowledges an understanding of the process or principle by verbally explaining the process or principle back to the practicum instructor.

**LEVEL 3:** Practiced: Student has practiced the process under the direction and maximum supervision of the practicum instructor. The student demonstrates a knowledge of how to perform the process or task by actual performance under direct, maximum supervision, but without having to demonstrate any particular competency of that task or process.

**LEVEL 4:** Maximum Supervision: The student has performed the process under the direct, maximum supervision of the practicum instructor, and with the level of competency required by the laboratory for that task or process.

**LEVEL 5:** Minimum Supervision: The student can perform the process satisfactorily with only minimum, or non-direct supervision by the practicum instructor, and the performance meets the level of competency required by the laboratory for that task or process.

**N/A:** Not Available/Applicable: Due to the nature of the laboratory, the student does not have access to the equipment/test method.

OBJECTIVE	EARNED SCORE	N/A	INSTRUCTOR INITIALS	DATE
<b>AUTOMATED HEMATOLOGY</b>				
<b>Specimen processing and handling:</b> <ul style="list-style-type: none"><li>Accepts into the laboratory appropriate and correctly labeled specimens for testing</li><li>Takes appropriate action if specimen is unacceptable</li><li>Correctly processes specimens for testing</li></ul>				

<ul style="list-style-type: none"> <li>Maintains sample identity and worksheet documentation throughout processing</li> </ul>				
<b>QC: Participate in quality control and maintenance practices.</b> <ul style="list-style-type: none"> <li>Runs QC as directed, and correctly interprets results</li> <li>Performs and documents daily and/or weekly maintenance</li> <li>Recognizes QC failure and notifies trained personnel and initiates corrective action</li> <li>Applies the "Rule of Three"</li> </ul>				
<b>Instrumentation operation:</b> <ul style="list-style-type: none"> <li>Follows written/verbal directions for instrument operation</li> <li>Organizes and prioritizes workload</li> <li>Correctly processes micro samples</li> <li>Recognizes basic instrument problems and notifies trained personnel if necessary</li> </ul>				
<b>Interpretation and Reporting:</b> <ul style="list-style-type: none"> <li>Identifies valid results and can spot inconsistencies or questionable ones</li> <li>Identifies panic values and notifies trained personnel</li> <li>Identifies possible sources of error and initiates resolution;</li> <li>Reports results without error</li> <li>Handles documents, record-keeping, and reports per policy</li> <li>Interprets histograms/scatterplots</li> </ul>				
<b>Complete Blood Count</b> <ul style="list-style-type: none"> <li>Define terms and formulas when appropriate for WBC, RBC, Hgb, MCH, MCV, MCHC, RDW, and Plt</li> <li>Calculate MCH, MCV and MCHC</li> </ul>				
<b>Correlations</b> <ul style="list-style-type: none"> <li>Correlates CBC results of RBC, WBC, morphology, and platelets with peripheral smear</li> <li>Recognizes and correlates age values with CBC results</li> <li>Recognizes results that require follow-up</li> <li>Correlates CBC and differential results with <u>major</u> pathological conditions</li> </ul>				
<b>OBJECTIVE</b>	<b>EARNED SCORE</b>	<b>N/A</b>	<b>INSTRUCTOR INITIALS</b>	<b>DATE</b>
<b>MANUAL HEMATOLOGY</b>				
<b>Specimen processing and handling</b> <ul style="list-style-type: none"> <li>Accepts into the laboratory appropriate and correctly labeled specimens for testing</li> <li>Takes appropriate action if specimen is unacceptable</li> <li>Correctly processes specimens for testing</li> <li>Maintains sample identity and worksheet documentation throughout processing</li> </ul>				
<b>QC: Participate in quality control and maintenance practices.</b> <ul style="list-style-type: none"> <li>Runs QC as directed and correctly interprets results</li> <li>Performs and documents daily and/or weekly maintenance</li> <li>Recognizes QC failure, notifies trained personnel, and initiates corrective action</li> </ul>				
<b>Blood Smears and Wright Stain</b> <ul style="list-style-type: none"> <li>Prepare acceptable peripheral blood smears for staining</li> <li>Prepare acceptable Wright-stained slides for differential and RBC evaluation</li> </ul>				

<b>Manual normal differential with morphology</b> <ul style="list-style-type: none"> <li>Perform at least 20 normal differential counts and agree with department results within established guidelines</li> <li>Correctly identify eosinophils, basophils, segmented neutrophils, bands, lymphocytes, and monocytes</li> <li>Report RBC morphology (normocytic/normochromic, microcytic/hypochromic, etc)</li> </ul>				
<b>Relative and absolute WBC values</b> <ul style="list-style-type: none"> <li>Calculate relative and absolute WBC values</li> </ul>				
<b>Manual abnormal anemia morphology</b> <ul style="list-style-type: none"> <li>Identify immature RBCs</li> <li>Identify morphology such as polychromasia, poikilocytosis, anisocytosis, and RBC inclusions</li> </ul>				
<b>Manual abnormal WBC differentials</b> <ul style="list-style-type: none"> <li>Perform at least 20 abnormal differential counts and agree with department results within established guidelines</li> <li>Identify lymphoid and myeloid morphological stages of maturation such as those seen in leukemias</li> </ul>				
<b>Estimate WBC and platelet counts from a Wright-stained smear</b> <ul style="list-style-type: none"> <li>Estimate WBC and platelet counts from a Wright-stained smear and agree with laboratory department results within established guidelines</li> </ul>				
<b>Special Stains</b> <ul style="list-style-type: none"> <li>Discuss the purpose of special stains in hematology</li> </ul>				
<b>Nucleated Red Blood Cells (NRBC)</b> <ul style="list-style-type: none"> <li>Correct WBC counts for NRBCs</li> </ul>				
<b>Normal and abnormal RBC and WBC morphology, artifacts, and inclusions</b> <ul style="list-style-type: none"> <li>Recognize normal and abnormal RBC and WBC morphology, artifacts, and inclusions</li> </ul>				
<b>Sedimentation rate (ESR)</b> <ul style="list-style-type: none"> <li>Correctly perform ESR—Westergren or Wintrobe</li> <li>Site the reference range for men, women, and children</li> </ul>				
<b>Reticulocyte count</b> <ul style="list-style-type: none"> <li>Perform manual reticulocyte counts and agree with the laboratory department results within established guideline</li> <li>State reference ranges and the meaning of abnormal results</li> </ul>				
<b>OBJECTIVE</b>	<b>EARNED SCORE</b>	<b>N/A</b>	<b>INSTRUCTOR INITIALS</b>	<b>DATE</b>
<b>Manual microhematocrit</b> <ul style="list-style-type: none"> <li>Correctly perform manual microhematocrits</li> </ul>				
<b>Sickle cell screening</b> <ul style="list-style-type: none"> <li>Correctly performs sickle cell screening</li> </ul>				
<b>BODY FLUIDS</b>				
<b>Cell counts</b> <ul style="list-style-type: none"> <li>Correctly perform cell counts for synovial, serous, and cerebrospinal (CSF) fluids and agree with the laboratory department results within established guideline</li> <li>Correctly perform differentials for synovial and CSF fluids and agree with the laboratory department results within established guideline</li> </ul>				
<b>COAGULATION</b>				

<b>Specimen processing and handling:</b> <ul style="list-style-type: none"> <li>• Accept for testing, appropriate and correctly labeled specimens for testing</li> <li>• Correctly processes specimens for testing</li> <li>• Maintains sample identity and worksheet documentation throughout processing for send-out or analyses</li> </ul>				
<b>QC: Participate in quality control and maintenance practices</b> <ul style="list-style-type: none"> <li>• Runs QC as directed and correctly interprets results</li> <li>• Performs and documents daily and/or weekly maintenance</li> <li>• Recognizes QC failure, notifies trained personnel, and initiates corrective action</li> </ul>				
<b>Instrumentation operation:</b> <ul style="list-style-type: none"> <li>• Follows written/verbal directions for instrument operation</li> <li>• Relates coagulation analysis with test methodology(s)</li> <li>• Correctly processes micro-samples</li> <li>• Organizes and prioritizes workload</li> <li>• Recognizes basic instrument problems and notifies trained personnel if necessary</li> </ul>				
<b>PT, APTT, and Fibrinogen</b> <ul style="list-style-type: none"> <li>• Correctly perform PT, APTT, and fibrinogen assays</li> <li>• Cite reference ranges for each test</li> </ul>				
<b>D-Dimer/FDP</b> <ul style="list-style-type: none"> <li>• Correctly perform D-Dimer/FDP assays</li> <li>• Cite reference ranges for each test</li> </ul>				
<b>Interpretation and Reporting:</b> <ul style="list-style-type: none"> <li>• Identifies valid results and can spot inconsistencies or questionable ones</li> <li>• Identifies panic values and notifies trained personnel</li> <li>• Identifies possible sources of error and initiates resolution;</li> <li>• Reports results without error</li> <li>• Handles documents, record-keeping, and reports per policy</li> </ul>				
<b>TOTAL NUMBER OF COMPETENCIES MET: /140</b> (Passing score is ≥80%)				

### Rare Procedures

The following tests may be performed at some clinical affiliates. Instructors, please document if students have observed and/or performed these tests:

Manual Platelet Count	_____	Manual Eosinophil Count	_____
Hemoglobin S preps	_____	Fetal Cell Stain	_____
Hemoglobin Electrophoresis	_____	Folate	_____
Bone Marrow	_____	Plasma Hemoglobin	_____
LAP stain	_____	Haptoglobin	_____
Vitamin B12	_____	Carboxyhemoglobin	_____

**Comments:**

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Discipline	Instruments Utilized to Evaluate Work Practice Skills
Automated Hematology Instrumentation	
Automated Coagulation Instrumentation	
Other	

**Assessment Tool for PLO #4:**

MEDICAL LABORATORY SCIENCE (MLS)		
Program Learning Outcome (PLO #4): Students will demonstrate the application of laboratory principles.		
Introduce**	Reinforce**	Master**
<ul style="list-style-type: none"> <li>Follows workflow protocol utilizing procedures/operating manuals and/or verbal directions from the instructor.</li> </ul>	<ul style="list-style-type: none"> <li>Interprets laboratory results.</li> </ul>	<ul style="list-style-type: none"> <li>Evaluates pre-analytical, analytical, and post-analytical laboratory processes alongside the patient's reported physiologic condition to assess the reliability of test results.</li> </ul>

**\*\*IMPORTANT NOTES:** The ratings, identified by the column headings, are of increasing complexity moving across the table (from left to right). Students who can interpret information presented in laboratory-based case study problems (that is, meet the “reinforce” rating) must be able to first identify the problem (the “introduce” rating). Likewise, in order for students to propose solutions (the “master” rating), they must identify the problem (introduce) and interpret pertinent information (“reinforce” rating).