Microbiology Clinical Competency Checklist - MLS 435 Clinical Microbiology

LABORATORY CLINICAL EXPERIENCE OBJECTIVES

At the completion of the MLS 435 course, the student will have successfully completed the following:

1. Demonstrate the proper use of the bright-field microscope. (pre-analytical)
2. Comply with established safety procedures in the parasitology, mycology, and bacteriology sections of the microbiology laboratory. (pre-analytical)
3. Apply the principles of sterility to media, reagents, and related materials. (preanalytical)
4. Utilize the quadrant streak method to isolate colonies on plate media. (analytical)
5. Incubate organisms under their optimal growth conditions.
6. Utilize the appropriate identification procedure to identify a potential pathogen. (analytical)
7. Apply the principles of colony characteristics and hemolytic patterns to recognize different bacterial colonies. (analytical)
8. Differentiate between beta, alpha, and gamma hemolytic patterns on sheep blood agar. (analytical)
9. Perform a Gram stain and recognize if it was correctly stained or under decolorized, or over-decolorized.
10. Describe the cell characteristics for the following bacteria: *Bacillus* and *Clostridium* including spores, *Corynebacterium* , *Lactobacillus, Staphylococcus, Streptococcus, Moraxella catarrhalis,* and bacteria in the Enterobacteriaceae family.
11. Read a specimen Gram stain, and write the results in the standard format. (analytical, post-analytical)
12. Examine simulated specimen cultures of the upper and lower respiratory tract, urine, stool, genital, and skin for potential pathogens and normal flora.
13. Utilize the appropriate media to isolate *Salmonella, Shigella, Aeromonas, Vibrio, Neisseria gonorrhoeae, Streptococcus pneumoniae,* and *Haemophilus* sp.
14. Inoculate the appropriate selective media to isolate potential pathogens.
15. Interpret differential media, such as MacConkey and Hektoen agar plates, correctly. (post-analytical)
16. Inoculate the appropriate biochemicals to screen for or identify possible pathogens and interpret the results. (analytical, post-analytical)
17. Perform and interpret rapid tests, such as coagulase, latex agglutination, and spot indole, to identify pathogens. (analytical, post-analytical)
18. Perform a Gram stain, observe the colony characteristics, and perform tests to confirm that an isolate is a non-glucose fermenting Gram negative rod.
19. Recognize the 'gull wing' cell characteristic that helps identify *Campylobacter* sp.
20. Inoculate a urine specimen with a calibrated (0.001 ml) loop to plate media. (preanalytical)
21. Calculate the colony count of a urine culture and report the result in colony forming units (analytical, post-analytical)
22. Identify clue cells in a Gram stain of a vaginal specimen.
23. Activate an anaerobic jar for the isolation of anaerobes.
24. Demonstrate how to differentiate a facultative anaerobe from an obligate anaerobe.
25. Identify unique colony and cell characteristics that would help identify an anaerobe.
26. Isolate a *Proprionibacterium* sp. from normal skin flora.
27. Utilize the following media, identification disks, and rapid tests to identify obligate anaerobes. (analytical, post-analytical)
    a. Inoculate a PRAS Brucella agar plate for isolation and identification purposes.
    b. Inoculate a Gram negative rod isolate onto a *Bacteroides* Bile Esculin (BBE) agar and interpret the results.
    c. Record the zone sizes around the kanamycin, colistin, and vancomycin disks and interpret the results.
    d. Record the zone sizes around the sodium polyanethol sulfonate (SPS) disk and interpret the results.
    e. Perform the spot indole test ρ-dimethylaminocinnamaldehyde (DMACA) and catalase test when indicated.
    f. Recognize double beta hemolysis produced by *Clostridium perfringens.*
28. Perform a Kirby Bauer disk susceptibility test according to a Clinical and Laboratory Standards Institute (CLSI) standardized procedure.
29. Measure the clear area (zone size) around each antibiotic disk, if there is one.
30. Interpret zone sizes according to the CLSI zone diameter interpretive standard table. (post-analytical)
31. Perform a D-test to determine whether an isolate is sensitive or resistant to clindamycin and interpret the results. (analytical, post-analytical)
32. Perform a vancomycin screen test to detect vancomycin resistant *Enterococcus* sp. isolates and interpret the results. (analytical, post-analytical)
33. Inoculate microdilution susceptibility panel according to the instructions. (analytical)
34. Evaluate the microdilution wells, including the control wells, for growth or no growth. (analytical)
35. Interpret whether the organism is susceptible, intermediate, or resistant to an antibiotic by consulting the CLSI minimum inhibitory concentration (MIC) interpretive standard table. (post-analytical)
36. Perform a beta lactamase test and interpret whether a beta lactamase was produced. (analytical, post-analytical)
37. Locate mycobacteria in a Kinyoun stain.
38. Locate a "ghost cell" in a Gram stain, and indicate what it signifies.
39. Detect an encapsulated yeast in an India ink preparation.
40. Choose the appropriate wet mount to examine microscopic fungal characteristics.

41. Describe the color and texture of a mold culture.
42. Recognize septate and nonseptate hyphae in a stained fungal slide.
43. Differentiate between a hyaline and a dematiaceous fungal colony.
44. Choose the appropriate fungal primary isolation media, selective media, and biochemicals for identification purposes.
45. Choose the appropriate fungal direct examination method of a patient specimen.
46. Identify fungal asexual conidia and their supporting structures seen in a stained smear.
47. Utilize pertinent macroscopic and microscopic characteristics for the purpose of identifying fungi. (post-analytical)
48. Differentiate between a positive and negative germ tube test, and recognize which one indicates a *Candida albicans* and which one indicates a *Candida* sp.
49. Utilize the correct magnification when screening for cysts, trophozoites, oocysts, helminth ova, and blood parasites.
50. Screen a wet preparation, with the addition of Lugol's iodine, of fecal sedimentation samples for pathogenic ova, larvae, and cysts. (analytical)
51. Screen iron hematoxylin and trichrome stained fecal smears for cysts and trophozoites.
52. Identify the cysts and trophozoites of *Giardia lamblia, Entamoeba coli, E. dispar, and E. histolytica*. (analytical, post-analytical)
53. Differentiate between *Entamoeba histolytica* and *Entamoeba histolytica/dispar*.
54. Screen a fecal modified acid fast stain and locate a *Cryptosporidium* sp. oocyst.
55. Screen stained thin blood smears and locate microfilariae and *Trypanosoma* spp.
56. Recognize *Plasmodium* sp. infected red blood cells.
57. Recognize and describe the key characteristic that will identify cestodes, trematodes, and nematodes. (analytical)
58. Explain why a cellophane or "sticky paddle" is for the collection of a parasite, and identify that parasite.
59. Locate larva in a fecal sedimentation sample, and list the roundworms that produce larva.
60. Design a quality control procedure for microbial media and test procedures. (preanalytical)
61. Follow written and verbal instructions.
62. Prioritize tasks and work concurrently on at least two different tasks.
63. Advocate respect for self and others while working independently and in groups.

Students should work with their respective mentors to complete the listed objectives. Accuracy, precision, timely reporting of results and demeanor must comply with the laboratory's acceptable standards. While working in the laboratory, the student must meet laboratory standards for work habit skills in patient confidentiality, communication skills, laboratory safety, universal precautions, waste disposal, equipment, and work area maintenance. It is requested that the student's laboratory competency evaluation be completed by the clinical mentor in the presence of the student, so as to allow verbal feedback to the student regarding the student's progress and performance. It is understood that not all laboratories will offer the same clinical experience, but mentors should try to accomplish all items in the checklist if the services are available at that location.

Note: As part of the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) accreditation regulations, no student may engage in service work during his/her clinical experience. All laboratory test results generated by students during their clinical hours must be directly supervised by clinical laboratory staff. While the student is performing their clinical hours, they must be performing duties as a student, and not an employee.

Course Instructor: _____

Clinical Preceptor(s): _____

Clinical Site(s): _____

Student name: _____

SCORING KEY

1: Discussed: Process was discussed, principle explained, student acknowledges an understanding of the process or principle.

2: Demonstrated: Process has been performed and demonstrated by the practicum instructor. Student has observed 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.

3: 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.

4: 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: The nature of the laboratory does not allow the student access to the equipment/test method.

Note: The competencies will be graded for a total of 266 pts. Points will be deducted for competency categories that are not met. If an item is not available at the lab, please N/A that area so the student does not lose points. If something is not available, but was discussed with the student, please write, "1 – N/A". Students must achieve a minimum of 80% on their competency checklist to pass.

Please note that the goal of the lab competencies is for your mentor to feel comfortable with your ability in the microbiology lab. If your mentor does not feel that the minimum required time is adequate, you should work out a schedule with them to spend more time in the microbiology lab.

Please have all clinical preceptors sign and date below.

Clinical Preceptor Signature _____ **Date** _____

Clinical Preceptor Signature _____ **Date** _____

Clinical Preceptor Signature _____ **Date** _____

Clinical Preceptor Signature _____ **Date** _____

Comments:

Student name: _____

Orientation and lab safety	**Mandatory**	**Expected Score**	**Student Score**	**Date**	**Mentor initial**
Discuss Standard Precautions for microbiology.	M	1			
Discuss biosafety laboratory levels and precautions and PPE required at the facility	M	1			
Basic laboratory skills					
Demonstrate pipette accuracy and precision	M	4			
Identify components and cleaning/maintenance of microscope	M	3			
Demonstrate use of different objectives and focusing of scope	M	4			
Demonstrate proper biosafety cabinet procedures	M	4			
Specimen set up & incubation					
Select proper primary media for specimens including plated media for aerobic culture, broth media, anaerobic, fungal media (if available), and slides for Gram stains	M	4			
Understand specimen collection & rejection criteria	M	4			
Incubate specimens properly including anaerobic and fungal cultures	M	4			
Inoculation					
Perform plate streaking for isolation & quantitative streaking for urines		4			
Subculture 10 samples with adequate isolation	M	4			
Quality control					
Perform quality control procedures in accordance with institutional policies for new media, reagents, and stock culture organisms		4			
Understand documentation and actions taken when results are not within acceptable limits		4			
Gram staining					
Discuss sputum rejection criteria		1			
Perform Gram stain procedure until proficient with minimal supervision	M	4			
Evaluate Gram stains, including sputum samples, wounds, CSF, body fluids and positive blood cultures until results are acceptable.	M	4			
Demonstrate proficiency in recognizing somatic cells in Gram stains	M	4			
Demonstrate proficiency in recognizing various Gram-positive cocci in Gram stains	M	4			
Demonstrate proficiency in recognizing various Gram-negative bacilli in Gram stains	M	4			
Demonstrate proficiency in recognizing various anaerobic bacteria in Gram stains		4			
Evaluation of primary cultures					
Evaluate cultures and discuss how to recognize what is resident flora and what is significant		4			
Evaluate throat cultures & recognize next course of action		4			
Evaluate urine cultures to decide when identification and susceptibility testing is warranted		4			
Evaluate stool cultures & discuss next course of action		4			
Evaluate body fluid cultures for potential pathogens		4			
Evaluate wound cultures, recognize what is significant, & select next course of action		4			
Evaluate respiratory cultures, including sputum cultures. Discuss respiratory flora & potential pathogens		4			
Blood culture processing					
Demonstrate procedure for processing positive blood cultures including subcultures, Gram stains, and proper reporting of results		4			
Demonstrate rapid identification and resistance marker detection from positive blood cultures		2			
ID of organisms					
Recognize and identify Streptococcus and Enterococcus species	M	4			

Student name: _____

ID of organisms (Continued)	**Mandatory**	**Expected Score**	**Student Score**	**Date complete**	**Mentor initial**
Recognize and identify Staphylococcus species	M	4			
Recognize and identify Neisseria species		4			
Recognize and identity Gram negative bacilli	M	4			
Perform manual identification panels (e.g. API, RapID)	M	4			
Perform MALDI-TOF MS		4			
Perform automated identification systems		4			
Perform Spot Tests	M	**4**			
Recognize and identify Gram-positive bacilli in cultures	M	4			
Recognize and identify non-fermentative bacilli in cultures	M	4			
Antimicrobials					
Select appropriate pathogens to perform antimicrobial susceptibility testing. Setup and interpret antimicrobial tests i.e. disk diffusion, automated systems (Microscan, Vitek, etc.)		4			
Discuss guidelines for MIC and disk diffusion breakpoint ranges	M	1			
Discuss antimicrobial resistance: VRE, MRSA, VRSA, ESBL, CRE, CRAB, and CRPA	M	1			
Anaerobic Bacteria					
Select the proper anaerobic media for plating of specimens for anaerobic culture		4			
Discuss proper specimen collection, handling, and transport conditions pertaining to anaerobic bacteria		1			
Identify anaerobes in clinical specimens to the extent performed at your facility		3			
Mycobacteria					
Process mycobacteria specimens to the extent available at your facility		3			
Read acid-fast smears		3			
Observe mycobacterial molecular testing (DNA probes, GeneXpert, etc.)		2			
Observe weekly culture checks		2			
Discuss identification of the most common organisms		1			
Viruses					
Discuss cell culture		1			
Process specimens for viral procedures		3			
Perform RSV and Influenza testing		4			
Parasites					
Process and read specimens for O&P exams to the extent available at your facility		4			
Perform testing for Giardia antigen, *C. difficile* toxins, and other stool pathogen testing (as available at your facility)		3			
Evaluate specimens for blood parasites, including malaria antigen and stain (if available)		2			
Mycology					
Discuss proper specimen collection and transport issues related to Mycology		1			
Process specimens for fungal culture to the extent performed at this facility		3			
Observe Cryptococcal antigen detection testing (if available)		2			
Interpretation and acceptance of results					
Discuss recording, reporting, and documenting results		1			
Discuss which organisms are reportable to the State Health Department (state dependent)		1			
Discuss reporting and recording of critical/alert values		1			
Molecular testing					
Review molecular testing at your facility if available		1			

Student name: _____

Molecular Testing: (Continued)		**Expected Score**	**Student Score**	**Date complete**	**Mentor initial**
Demonstrate MALDI-TOF testing		4			
Demonstrate the proper use of micropipettes		4			
Perform molecular detection, rapid methods		4			
Observe molecular detection, extraction, and real-time PCR		2			
Observe molecular detection, automated, high-volume platforms		2			
Observe sequencing prep and analysis		2			
Student demonstrates honesty by:					
Maintaining strict patient confidentiality	M	4			
Accepting control values only when within acceptable limits	M	4			
Properly performing and documenting daily & weekly maintenance procedures, preventative maintenance, temperature checks, etc.	M	4			
Completing all procedures in adherence to laboratory SOPs, taking no shortcuts or unauthorized modifications of procedure	M	4			
Student demonstrates personal interactive skills and proper professional behavior by:					
Working with co-workers in a positive manner, promoting productive workflow	M	4			
Refraining from making statements or actions that represent sexual, ethnic, racial, or homophobic harassment	M	4			
Willingly and consistently using appropriate personal safety devices when handling caustic, infectious, or hazardous materials	M	4			
Completing all required tasks and remaining in the work area when scheduled	M	4			
Being punctual whenever scheduled	M	4			
Adhering to current dress and appearance in the laboratory setting	M	4			
Cleaning the work area when leaving the laboratory, returning supplies to appropriate storage location, & disinfecting all work areas used by the student	M	4			
Student demonstrates professional responsibility by:					
Correctly reporting all patient test values, as well as recognizing and correctly reporting all patient critical test values	M	4			
Resolving discrepancies in specimen labeling, handling, or collection before reporting results	M	4			
Hours completed by student:		**Required Hours**	**Student Hours**	**Date Complete**	**Mentor Initial**
Note: The minimum time required in microbiology is 96 hours. However, mentors are encouraged to increase the number of hours dependent on individual student need.		96 hours			