



MLTS 120-Introduction to Medical Laboratory Science

3 CREDITS

SYLLABUS

CATALOG DESCRIPTION

Introduces the student to the scope of practice of the laboratory professional. Students will use or apply basic concepts used in the medical laboratory including terminology, instrumentation, safety, basic statistics, physician office settings and quality assurance.

Selected areas of laboratory practice will be presented.

Prerequisites: Pre/co-requisites Accuplacer minimum score of English 85, Reading 82, Math 61 and completion of high school chemistry and biology

Semester Offered: Fall

Common Student Learning Outcomes

Upon successful completion of San Juan College programs and degrees, the student will demonstrate competency in...

BROAD AND SPECIALIZED LEARNING

Students will actively and independently acquire, apply, and adapt skills and knowledge with an awareness of global contexts.

CRITICAL THINKING

Students will think analytically and creatively to explore ideas, make connections, draw conclusions and solve problems.

CULTURAL AND CIVIC ENGAGEMENT

Students will act purposefully, reflectively, and ethically in diverse and complex environments.

EFFECTIVE COMMUNICATION

Students will exchange ideas and information with clarity in multiple contexts.

INFORMATION LITERACY

Students will be able to recognize when information is needed and have the ability to locate, evaluate, and use it effectively.

INTEGRATING TECHNOLOGIES

Students will demonstrate fluency in the application and use of technologies in multiple contexts.

Student work from this class may be randomly selected and used anonymously for assessment of course, program, and/or institutional learning outcomes. For more information, please refer to the Dean of the appropriate School.

COURSE LEARNING OUTCOMES

Upon the completion of the lectures, laboratory sessions, demonstrations, case studies, and reading assignments the student will be able to

1. Comply with the rules and regulations for safe practice in the clinical laboratory including breaking the chain of infection. (BSL, CT, CCE)
2. Develop microscopic skills to identify a variety of biological cellular elements. (BSL, CT, IT)
3. Develop skills in the operation of semi-automated devices used in the clinical laboratory. (BSL, IT)
4. Apply the principles of spectrophotometry and calibration to automated analyzers used in the clinical laboratory. (BSL, CT, IT)
5. Appreciate and apply the principles of quality assurance in the clinical laboratory. (BSL, CT, EC, IT)

Upon completion of the lecture series and laboratory, the student will be able to satisfy the cognitive objectives listed below. The criteria for satisfying the cognitive objectives is scoring 70% on written examinations. Specific criteria is listed for laboratory and psychomotor objectives.

SPECIFIC LEARNING OBJECTIVES

Upon completion of the lecture series, laboratory sessions, demonstrations, case studies, and reading assignments the student will be able to

1. Describe the regulation and accreditation of clinical laboratories. (Level 2)
2. Explain term Universal and Standard Precautions and how it applies to the clinical laboratory. (Level 2)
3. Explain the OSHA standards. (Level 2)
4. Explain two methods of decontamination in the laboratory and main uses of each. (Level 2)

5. Describe what an MSDS sheet is and explain the value of the information it contains. (Level 2)
6. List the different types of barrier equipment and explain the conditions when each is to be used. (Level 2)
7. Explain and apply the rules for rounding off numbers and for the use of significant figures. (Level 2)
8. Describe the procedure and calculate the volumes needed for making a single dilution and a serial dilution. (Level 3)
9. Calculate and prepare solutions when given the different conditions as molar, normal, % weight, % volume.(Level 3)
10. Explain the term Quality Assurance. (Level 2)
11. Discuss sources of error including preanalytical, analytical and post analytical errors and categorize examples of each. (Level 3)
12. Explain the importance of a quality control program including the use of control samples, the determination of the control range and the use of quality control charts. (Level 2)
13. Define and compare and contrast standard, calibrator and control. (Level 3)
14. List and explain the Westgard rules for interpretation of laboratory control data.(Level 2)
15. Define proficiency testing.(Level 1)
16. Discuss the terms accuracy, precision, specificity and sensitivity as related to laboratory tests and methodologies and calculate sensitivity and specificity from given data (Level 3)
17. Given a set of data for a method, prepare a Levy Jennings graph including calculation of the mean and standard deviation to be used for quality control.(Level 3)
18. Define the terms ketone, insulin,diabetes mellitus, glycogen, glycogenesis, glycogenolysis, glycolysis, gluconeogenesis, hyperglycemia and hypoglycemia. (Level 1)
19. Discuss the regulation of glucose concentration in the body and state the healthy reference interval for glucose. (Level 2)
20. Discuss the method principle, specimen requirements, and known interferences of the glucose oxidase determination for glucose. (Level 2)
21. Explain the function and structure of the organs of the urinary system including Kidney, bladder, ureter, and urethra. (Level 2)
22. Describe the function and structure of the essential parts of the nephron including: glomerulus, afferent arteriole, proximal convoluted tubule, loop of Henle, Bowman's capsule, efferent arteriole, distal convoluted tubule, collecting duct. (Level 2)
23. Describe how urine is formed. (Level 2)
24. Explain the general principle of operation, safety issues with each, and proper care and calibration of:
 - a) Semi-automated pipetting devices. (Level 2)
 - b) Macro pipettes. (Level 2)
 - c) Spectrophotometers.including Beers law and calculation of unknown samples (Level 3)
 - d) Microscopes (Level 2)
 1. Brightfield
 2. Fluorescent
 3. Darkfield
 4. Polarizing
 - e) Analytical balance (Level 2)
 - f) Centrifuge. (Level 2)
 - g) Neubauer-ruled hemacytometer and calculation of cell counts. (Level 3)
25. List the reference ranges for RBC, WBC, RBC indices and platelets for adults. (Level 1)
26. Recognize the RBC and WBC maturation sequence for each cell line. (level 1)
27. Discuss the clinical significance of abnormal CBC values and correlate to differential. (Level 3)
28. Discuss the qualities and factors, which contribute to a well-made blood smear. (Level 2)
29. Evaluate and recognize a properly prepared blood smear. (Level 4)
30. Discuss the staining reaction of the Wright's stain and explain the causes of an overly blue or pink stain. (Level 2)
31. Correctly identify and quantitate neutrophils, lymphocytes, monocytes, basophils, eosinophils and evaluate red cell morphology. (Level 4)
32. Estimate platelet and WBC counts from a differential and agree within 20% or measured values. (Level 4)
33. Discuss the significance of the presence of large and platelet clumps. (Level 2)
34. Discuss the nematode parasites as to scientific name, common name, geographic distribution, life cycle, diagnostic stage, diagnostic specimen, pathogenesis, epidemiology and treatment for (Level 2)
 1. *Enterobius vermicularis*
 2. *Ascaris lumbricoides*
 3. *Trichuris trichiura*
 4. *Stongyloides stercoralis*
 5. *Hookworm*
 6. *Dracunculus medinensis*
 7. *Trichinella spiralis*
35. Define urinalysis and describe its three main components. (Level 2)
36. Discuss the chemical composition of normal urine. (Level 2)
37. Describe a suitable urine specimen for routine urinalysis, including storage and preservation. (Level 2)
38. Identify and describe normal and abnormal physical properties that might be encountered in urine specimens and correlate physical findings with chemical findings. (Level 4)
39. Correlate chemical and physical findings with possible pathophysiology. (Level 4)
40. For each of the chemical analytes tested on the test strip 10 describe the clinical significance of the test, the principle of the test, specificity and sensitivity, interfering substances and additional considerations associated with the test. (Level 2)
41. Describe the functions of the clinical microbiology laboratory.(Level 1)
42. Describe the common gram stain reactions for common bacteria isolated in the medical laboratory. (Level 2)

43. Discuss the purpose of different types of growth media and classify the type of media as to being enrichment, supporting, selective, or differential. (Level 2)
44. Describe the different types of hemolysis and correlate with possible microorganisms.
45. Explain the CDC classification of biological agents. (Level 2)

PSYCHOMOTOR SKILLS OBJECTIVES

Upon completion of the lecture series, the student will be able to:

1. Operate a spectrophotometer.
2. Operate and care for the microscope according to protocol.
3. Work in an organized fashion as demonstrated by:
 - a) Completing laboratory procedures on time.
 - b) Maintaining a neat work area.
 - c) Transcribing data accurately and legibly.
 - d) Identifying and labeling all specimens and reagents correctly and legibly.
 - e) Record quality control values in appropriate folder accurately and legibly, and assess reliability of patient samples in light of these values.
4. Perform a differential on five (5) normal samples and match reported results within 5-10% for each cell type.
5. Perform a blood glucose procedure and be within acceptable limits.
6. Test three urine specimens for chemical constituents with a chemistry strip using correct technique and report results within one read block or reported results.
7. Identify nematode parasites and stages from a prepared smear, wet mount or picture to include
 1. *Enterobius vermicularis*
 2. *Ascaris lumbricoides*
 3. *Trichuris trichiura*
 4. *Stongyloides stercoralis*
 5. *Hookworm*
 6. *Dracunculus medinensis*
 7. *Trichinella spiralis*
 8. Prepare and evaluate a gram stain.

AFFECTIVE DOMAIN OBJECTIVES

Upon completion of the lecture series, the student will be able to:

1. Respect laboratory equipment including the microscope as demonstrated by proper use, request for additional instruction when necessary and proper cleaning and storage.
2. Adhere to the established departmental protocol as outlined in the safety manual and be able to state reasons for these policies.
3. Have an appreciation of the complexity of medical laboratory and an understanding of the need for continuing education to stay abreast of advances in the field.