



## **Course Syllabus**

### **MLAB 1201 Intro to Clinical Lab Science**

*Revision Date: 1/02/17*

**Catalog Description:** Introduction to medical laboratory science, structure, equipment, and philosophy.

**Lecture hours = 2, Lab hours = 1**

**Prerequisites:** None

**Semester Credit Hours:** 2

**Lecture Hours per Week:** 2

**Lab Hours per Week:** 1

**Contact Hours per Semester:** 32

**State Approval Code:** 51.1004

**Instructional Goals and Purposes:** The purpose of this course is to introduce the student to the field of clinical laboratory science. This course is an overview of the field of Medical Laboratory Technology (MLT).

#### **Learning Outcomes:**

1. Perform laboratory math.
2. Identify laboratory equipment.
3. Describe quality control, safety, accreditation, certification, professionalism, and ethics.

#### **Specific Course Objectives (includes SCANS):**

After studying all materials and resources presented in the course, the student will be able to:

1. **Chapter 1 (1a-i, ii, iv, v. 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**
  - a. Explain the role of the clinical laboratory in the delivery of healthcare.
  - b. Describe the findings of the U.S. Bureau of Labor Statistics regarding the clinical laboratory profession.
  - c. Name and differentiate between the functions of various professional organizations.
  - d. Compare the characteristics of individual professional certification, including the newest professional degree, and licensure.
  - e. Distinguish between various clinical laboratory staffing levels and functions.
  - f. Differentiate the classification of laboratory testing by complexity of the test: waived, moderately complex, highly complex, and provider-performed microscopy based on CLIA'88 regulations.
  - g. Name the three most frequent inspection deficiencies over time for all CLIA-approved laboratories.
  - h. Define the acronyms and explain the purpose of OSHA, CLIA'88, CMS, TJC, and CAP.
  - i. Name the typical departments of a clinical laboratory and briefly describe the functions of each department.
  - j. Explain the advantages of molecular testing, the newest direction in laboratory testing.
  - k. Draw and describe the organizational structure of a health care organization.

- l. Describe the importance of federal, state, and institutional regulations concerning the quality and reliability of laboratory work.
  - m. Compare and contrast the uses of various sites for laboratory testing: central laboratory, point of care, physician office laboratory, and reference laboratory.
  - n. Categorize the features of alternate sites of laboratory testing.
  - o. Define the abbreviation HIPAA, and assess the major points of the legislation.
  - p. Define the term ethics, and discuss medical applications.
  - q. Critically analyze and formulate an opinion related to each of the medical ethics case studies at the end of this chapter.
  - r. Complete chapter-related exercise and correctly answer related questions.
  - s. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above
- 2. Chapter 2 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**
- a. Analyze the six goals for healthcare delivery and provide examples the important issues in each goal category.
  - b. Explain why medical euphemisms are a bad habit and what negative outcomes can be generated by their use.
  - c. Evaluate a strategy to mitigate patient risk during an information technology outage and assess potential high priorities in a strategy.
  - d. Name three general causes of accidents in a clinical laboratory.
  - e. Describe the general functions of various governmental and professional agencies.
  - f. Describe the laboratory-related goals of the National Health care Safety Network.
  - g. Examine and compare the general safety regulations governing the clinical laboratory, including components of the OSHA-mandated plans for chemical hygiene and for occupational exposure to blood-borne pathogens, the importance of the safety manual, and general emergency procedures.
  - h. Define a laboratory acquired infection (LAI) and name the top 10 microorganisms causing.
  - i. Name the three most common viral causes of LAIs.
  - j. Contrast the basic aspects of infection control policies, including how and when to use personal protective equipment or devices (e.g., gowns, gloves, goggles) and evaluate the reasons for using Standard Precautions.
  - k. Explain proper decontamination of a work area at the beginning and end of a routine workday, as well as when a hazardous spill has occurred.
  - l. Assess pre-exposure and post-exposure prophylactic measures for handling potential occupational transmission of certain pathogens, especially hepatitis B virus (HBV) and human immunodeficiency virus (HIV).
  - m. Evaluate how to take the necessary precautions to avoid exposure to the many potentially hazardous situations in the clinical laboratory: biohazards; chemical, fire, and electrical hazards; and certain supplies and equipment (e.g., broken glassware).
  - n. Explain successful implementation of chemical hazards "right-to-know" rules.
  - o. Explain the process of properly segregating and disposing of various types of waste products generated in the clinical laboratory, including use of sharps containers for used needles and lancets.
  - p. Summarize the top six safety audit issues and summarize resolutions to each of the issues.
  - q. List and describe the basic steps of first aid.
  - r. Critically analyze and formulate an opinion related to the case study at the end of this chapter.
  - s. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
  - t. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.
- 3. Chapter 3 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**
- a. Explain the purpose of clinical laboratory testing.
  - b. Describe the purpose of the CLIA '88 quality control requirements and the categories of testing that are regulated.

- c. Name and describe the purpose of voluntary accrediting organizations.
- d. Assess the applicability and benefit of complying with ISO 15189.
- e. Compare the focus of Lean to Six Sigma in the clinical laboratory.
- f. Describe the importance of quality assessment.
- g. Describe at least three strategies to reduce overall errors in the clinical laboratory.
- h. Give at least two examples in each of the phases of testing: pre-analytical, analytical, and post-analytical.
- i. Describe the purpose and CLIA'88 requirements for proficiency testing in laboratories.
- j. Define the term, accuracy.
- k. Appraise the benefits including critical values and the Delta check system of a quantitative quality control program in a laboratory.
- l. Describe the composition and use of control specimens.
- m. Define terms used in quality assessment: calibration, control, precision, and standards.
- n. Compare accuracy versus precision and sensitivity versus specificity of a test and predictive values.
- o. Define the statistical terms of: mean, median, mode, standard deviation, confidence intervals, and coefficient of variation.
- p. Describe the use of reference values, including using the mean and standard deviation in determining reference range.
- q. Identify sources of variance or error of a procedure.
- r. Evaluate Levy-Jennings charts and Westgard rules for monitoring quality control.
- s. Identify factors contributing to questionable validity of the reference ranges of laboratory assays.
- t. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- u. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**4. Chapter 5 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**

- a. Define the terms, numerical aperture and resolution.
- b. Compare the magnification strength and applications of low-power, high-power and oil immersion lens.
- c. Identify the parts of the microscope.
- d. Name and explain the components of the illuminating and magnification systems of a microscope.
- e. Define parfocal, and describe how it is used in microscopy.
- f. Correlate various positions of the microscope condenser with different types of objectives.
- g. Describe the order of cleaning and the proper microscope cleaning techniques.
- h. Define alignment, and describe the process of aligning a microscope.
- i. Explain the procedure for correct light adjustment to obtain maximum resolution with sufficient contrast.
- j. Arrange the required steps in focusing the microscope to examine a slide specimen.
- k. Prioritize the necessary steps required to troubleshoot problems with using the microscope.
- l. Compare and contrast darkfield, fluorescent, and electron microscopy.
- m. Identify the components of the compensated polarized microscope, and describe their locations and functions.
- n. Name the components of a phase-contrast microscope, and explain how they differ from the components of a brightfield microscope.
- o. Describe the function and applications of artificial neural networks.
- p. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- q. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**5. Chapter 6 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**

- a. Convert metric units of measurement for weight, length, volume, and temperature to English units and English units to metric units.
  - b. Calculate temperatures from degrees Celsius to degrees Fahrenheit.
  - c. Calculate temperatures from degrees Fahrenheit to degrees Celsius.
  - d. Describe the various types of and uses for laboratory volumetric glassware, the techniques for their use, and the various types of glass used to manufacture them.
  - e. Explain how laboratory volumetric glassware is calibrated, how the calibration markings are indicated on the glassware, and proper cleaning protocol.
  - f. Evaluate the advantages and use of micropipettes, volumetric pipettes, and serologic pipettes.
  - g. Discuss the operation and uses of common laboratory balances.
  - h. Compare various types and uses of laboratory centrifuges.
  - i. Contrast various forms and grades of water used in the laboratory and how each is prepared.
  - j. List and describe the various grades of chemicals used in the laboratory, including their levels of quality and their purpose.
  - k. Define the terms solute and solvent, and calculate problems related to these constituents.
  - l. Identify the components of a properly labeled container used to store a laboratory reagent or solution.
  - m. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
  - n. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.
- 6. Chapter 7 (1a-i, ii, iv, v. 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**
- a. Explain and apply the rules for rounding off numbers and using significant figures.
  - b. Describe the use of exponents and interpret exponents.
  - c. Define the terms density and specific gravity.
  - d. Define the terms: molality, molarity, osmolality, and osmolarity.
  - e. Compare the expressions of solution concentration, weight per unit weight and weight per unit volume.
  - f. Determine the amount of solute and solvent needed to prepare a percent solution.
  - g. Calculate the requirements for solutions of a given volume and molarity.
  - h. Calculate the osmolarity of given substances.
  - i. Calculate proportions and ratios.
  - j. Calculate the amount of one solution needed to make a solution of a lesser concentration.
  - k. Describe the procedures for making a single dilution and a serial dilution.
  - l. Construct a table with the amount of serum and solvent for a 1:2, a 1:5, and a 1:10 serial dilution.
  - m. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
  - n. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.
- 7. Chapter 8 (1a-i, ii, iv, v. 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**
- a. Compare and contrast the four basic categories of measurement techniques, with examples of methods for each category.
  - b. Describe the principle of absorbance spectrophotometry.
  - c. Compare the observed colors of the visible spectrum and the corresponding wavelengths.
  - d. Define Beer's law.
  - e. Summarize the criteria for the preparation and use of a standard curve.
  - f. Name the components and describe the functions of a spectrophotometer.
  - g. Identify and describe the three quality control tests for spectrophotometers.
  - h. Describe the principle of reflectance spectrophotometry.
  - i. Describe the principle, advantages, and disadvantages of nephelometry.
  - j. Explain the principle of flow (cell) cytometry and its clinical application.
  - k. Describe the characteristics of enzyme immunoassay.
  - l. Identify and compare the three basic immunofluorescent labeling techniques.

- m. Critique the clinical applications of direct and indirect immunofluorescent assays.
- n. Compare at least three potential benefits of automated immunoassay.
- o. Differentiate the steps in a polymerase chain reaction (PCR) amplification technique.
- p. Compare various PCR modifications.
- q. Discuss the general concept of nucleic acid blotting.
- r. State the clinical applications of Western blotting techniques.
- s. Compare a pH electrode with an ion-selective electrode.
- t. Explain the technique of coulometry and chromatography.
- u. Differentiate the steps in the electrophoresis technique.
- v. Compare immunoelectrophoresis and immunofixation electrophoresis.
- w. Name the two types of chromatography and explain the conditions under which each is used.
- x. Discuss analytical techniques used in point of care testing.
- y. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- z. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**8. Chapter 9 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi, 2a-iii, 2c-i, ii, iii, iv, 2d-i, ii.)**

- a. Compare the major advantages and disadvantages of point-of-care testing (POCT).
- b. Identify the four categories of Clinical Laboratory Improvement Amendments (CLIA) test procedures.
- c. Discuss non-instrument-based testing methods (e.g., pregnancy, fecal occult blood).
- d. Provide examples of handheld POCT devices.
- e. Identify at least six characteristics to consider when selecting a POCT instrument.
- f. Describe overall product and functions of laboratory information systems.
- g. List and describe components of a computer system.
- h. Compare LAN, HIS, and WAN communications devices.
- i. Identify and describe five CLSI standards for design, compatibility, and integration of automated clinical laboratory systems.
- j. Critique at least five individual features of two different laboratory information systems.
- k. Categorize examples of preanalytical, analytical, and postanalytical testing.
- l. Compare future challenges in laboratory information management such as interfaces.
- m. Differentiate the major benefits of laboratory automation.
- n. Arrange and evaluate the five steps in automated analysis.
- o. Briefly describe the principle used by representative clinical chemistry analyzers to measure the concentration of substances.
- p. Explain the two types of technology used to count blood cells.
- q. Differentiate methods for performing automated cell differentials.
- r. Interpret the test principles used by automated instruments in urine chemical testing and microscopic analysis.
- s. Describe the structure and applications of microarray technology.
- t. Discuss the benefits and challenges encountered in molecular testing.
- u. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- v. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**9. Chapter 10 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi, 2a-iii, 2c-i, ii, iii, iv, 2d-i, ii.)**

- a. Differentiate different aspects of the normal physiology of glucose metabolism including glycogenesis, gluconeogenesis, lipogenesis, and glycolysis.
- b. Compare and contrast the pathophysiology of types 1 and 2 diabetes.
- c. Describe the symptoms of diabetes.
- d. Compare the conditions of hyperglycemia and hypoglycemia.
- e. Describe the collection procedures and various types of blood specimens for glucose analysis.
- f. Compare point-of-care testing to traditional testing methods for glucose.
- g. Describe the methods for qualitative and semiquantitative determination of glucose.

- h. Explain the significance of glycosylated hemoglobin in the management of diabetes.
- i. Identify and describe the function of electrolytes found in blood and body fluids.
- j. Compare osmolality and osmolarity.
- k. Assess osmolality and osmolal gap, and apply them to clinical situations.
- l. Calculate an anion gap, and apply it to clinical situations.
- m. Explain the role and alterations of acid-base balance and blood gases in the body.
- n. Compare and contrast renal function assays.
- o. Interpret the clinical significance of uric acid analysis.
- p. Assess the biochemical and physiologic characteristics of cholesterol, triglycerides, and lipoprotein.
- q. Compare and contrast at least three cardiac markers of acute myocardial infarction.
- r. Name various liver and pancreatic assays, and explain their clinical significance.
- s. Explain the importance of an ammonia assay.
- t. Integrate the physiology of bilirubin formation and associated abnormal conditions.
- u. Differentiate between different forms of bilirubin, and understand the clinical significance of various forms.
- v. Compare and contrast thyroid hormone assays and the clinical applications.
- w. Identify various tumor markers.
- x. Describe the characteristics of therapeutic drug assays.
- y. Identify drugs of abuse.
- z. Critique patient case histories, evaluate laboratory results, and correlate the pathophysiology of the defect with the diagnosis.
- aa. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- bb. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**10. Chapter 11 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi, 2a-iii, 2c-i, ii, iii, iv, 2d-i, ii)**

- a. Differentiate the process of hematopoiesis.
- b. Distinguish the characteristics in the formation of erythrocytes.
- c. Describe hemoglobin synthesis and normal and abnormal types of hemoglobin.
- d. Explain the difference between normal hemoglobin and for abnormal hemoglobin S.
- e. Distinguish the characteristics in the formation of leukocytes.
- f. Identify the types of mature leukocytes found in circulating blood, and describe the characteristics of each.
- g. Distinguish the cellular characteristics in the formation of thrombocytes.
- h. Discuss the mode and applications for the three types of anticoagulants used for hematology assays.
- i. Assess at least three types of unsuitable blood specimens and the effect of each on test results.
- j. Compare the effects of isotonic, hypotonic, and hypertonic solutions on blood cells.
- k. Describe the principle of the microhematocrit determination.
- l. Describe the procedure for counting and calculating erythrocytes, leukocytes, and platelets.
- m. Calculate a corrected white cell count and absolute WBC counts.
- n. Describe the calculations and applications of a reticulocyte count.
- o. Describe the application of the erythrocyte sedimentation rate (ESR).
- p. Calculate red blood cell indices of mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC).
- q. Explain the formula and application of the red cell distribution width (RDW).
- r. Describe the staining and examination of normal blood cells in a peripheral blood smear.
- s. Compare the three categories of anemia, based on morphology.
- t. Identify and describe the morphologic alterations of size, shape, color, inclusions, and abnormal distribution patterns in erythrocytes.
- u. Correlate leukocyte alterations with associated clinical conditions.
- v. Critique patient case histories, evaluate laboratory results, and correlate with the pathophysiology of the defect with the diagnosis.

- w. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- x. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**11. Chapter 12 (1a-i, ii, iv, v. 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**

- a. Correlate the three components of the hemostatic system.
- b. Explain the role of platelets in hemostasis and associated disorders.
- c. List and describe the role of the various coagulation factors.
- d. Break down the steps in the activity of the extrinsic pathway of coagulation.
- e. Break down the steps in the activity of the intrinsic pathway of coagulation.
- f. Differentiate the three major steps of the mechanism of coagulation.
- g. Describe the process of fibrinolysis.
- h. List the biological activities responsible for protecting the body against thrombosis.
- i. Differentiate the characteristics and applications of the most common laboratory tests used for coagulation and hemostasis.
- j. Describe the use of coagulation point-of-care tests.12:8 L3 Critique patient case histories, evaluate laboratory results, and correlate the pathophysiology of the defect with the diagnosis.
- k. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- l. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**12. Chapter 13 (1a-i, ii, iv, v. 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**

- a. Compare the characteristics of historic and modern urinalysis.
- b. Discuss the components of a quality assessment system for urinalysis.
- c. Describe the basic anatomic components of the urinary system and the function of each.
- d. Contrast the clinical usefulness of urinalysis and classify tests pertaining to diseases or conditions affecting the kidney or urinary tract and metabolic disease.
- e. Differentiate various urine specimen requirements for a routine urinalysis, including preservation and storage requirements.
- f. Categorize various types of urine collection, including midstream clean-catch, quantitative, and timed specimens and compare the differences.
- g. Define the term specific gravity.
- h. Correlate normal and abnormal physical properties that might be encountered in urine specimens with physical findings with chemical and microscopic findings.
- i. Correlate the relationship between urine volume and specific gravity.
- j. Discuss the chemical composition of normal urine.
- k. For each of the chemical analytes discussed in this chapter, evaluate the following: clinical importance, principle of the test, specificity and sensitivity, interferences, and additional considerations
  - l. Integrate the pathophysiology and significance of proteinuria due to glomerular damage, tubular damage, prerenal disorders, lower urinary tract disorders, asymptomatic proteinuria, and consistent microalbuminuria.
- m. Integrate the pathophysiology of hematuria, hemoglobinuria, and myoglobinuria, and explain how to differentiate among the respective analytes when a positive reagent strip test for blood is seen.
- n. Integrate the pathophysiology and clinical importance of tests for nitrite and leukocyte esterase and how they relate to each other.
- o. Integrate the pathophysiology and clinical importance of bilirubin and urobilinogen, and identify the laboratory findings in various types of jaundice.
- p. Describe conditions when urine should be examined microscopically.
- q. Correlate various urine sediment constituents that might be encountered, including pathophysiology and clinical importance.
- r. Describe the formation and significance of casts and how they are classified and reported.

- s. List the normal crystals encountered in acid and alkaline urine, and describe the most frequently encountered forms of each.
- t. List the abnormal crystals of metabolic and iatrogenic origin, and describe the most frequently encountered forms of each.
- u. Correlate the relationships among sediment, chemical, and physical findings in the urine.
- v. Recognize discrepant results when reviewing case studies of urinalysis findings (physical, chemical, and sediment), before results are reported.
- w. Critique patient case histories, evaluate laboratory results, and correlate the pathophysiology of the defect with the diagnosis.
- x. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- y. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**13. Chapter 14 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**

- a. Name various types of body fluids and synonyms.
- b. Integrate the components of a routine examination of cerebrospinal fluid, and clinical conditions, including gross examination, cell counts, morphologic examination, and common chemical tests.
- c. Differentiate a traumatic tap from a hemorrhage on the basis of gross appearance of the spinal fluid.
- d. Identify the serous fluids, and describe the components of their routine examination.
- e. Define the term effusion.
- f. Differentiate a transudate from an exudate.
- g. Define synovial fluid, and describe the components of a routine synovial fluid examination
- h. Interpret the microscopic examination of synovial fluid for gout and pseudogout, using compensated polarizing microscopy for the identification of crystals.
- i. Describe the components of a semen analysis, and state the normal reference range of cells in semen.
- j. Describe the function and properties of amniotic fluid.
- k. Name three types of studies of saliva.
- l. Critique patient case histories, evaluate laboratory results, and correlate the pathophysiology of the defect with the diagnosis.
- m. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- n. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**14. Chapter 15 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**

- a. Discuss and compare the traditional versus the modern techniques that can be used to classify organisms in microbiology.15:3 L2 Describe and compare the Biosafety Levels 1-4.
- b. Name and describe general safety practices in the Microbiology Laboratory.
- c. Discuss disinfection and sterilization techniques.
- d. Explain the importance of collection requirements for the various specimens used in microbiological studies.
- e. Explain the principle of the Gram stain reaction for Gram positive and Gram negative bacteria.
- f. Examine a Gram-stained smear for common bacteria and interpret the reaction.
- g. Select and inoculate the appropriate media for frequently collected specimens: urine, throat swabs, genitourinary exudates, and blood.
- h. Explain the collection of an appropriate specimen for a urine culture, quantitatively plate, and interpret results.
- i. Describe the collection process using a swab for a throat culture on sheep blood agar, plate it, and interpret results.
- j. Explain the major sexually transmitted diseases and the laboratory tests used in the microbiology laboratory.
- k. Explain the collection of genitourinary specimens for culture in the microbiology laboratory.



- l. Explain the collection of a blood for culture, and describe how to process and interpret the result primary culture result.
- m. Explain the collection of wound and soft tissue cultures.
- n. Describe the purpose of antimicrobial susceptibility testing.
- o. Explain the factors that affect the proper selection of an antimicrobial agent.
- p. Name and discuss the various aspects of quality control in the Microbiology Laboratory.
- q. Explain the characteristics of fungi and the common methods used to detect fungi in the laboratory.
- r. Explain the specimen collection and identification process for common intestinal parasites.
- s. Describe the three major structural components that are included in the structure of a virus or virion.
- t. List the steps required for a virus to infect a host cell.
- u. Define viral tropism and cytopathic effect.
- v. Describe cell culture and explain the significance of using a shell vial over conventional cell culture.
- w. Critique patient case histories, evaluate laboratory results, and correlate the these findings with the diagnosis
- x. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- y. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**15. Chapter 16 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi. 2a-iii. 2c-i, ii, iii, iv. 2d-i, ii.)**

- a. Define the term immunology.
- b. Define the terms antigen and antibody.
- c. Describe the general characteristics of antigens.
- d. Explain the general characteristics of antibodies.
- e. Evaluate the characteristics and clinical activities of the five classes of antibodies.
- f. Draw and explain the general configuration of an IgG antibody molecule.
- g. Define the term immune complex.
- h. Compare the terms monoclonal and polyclonal antibodies.
- i. Describe the production of monoclonal antibodies.
- j. Compare the characteristics of the four phases of an immune response.
- k. Explain the mode of activation and consequences of complement activation.
- l. Describe the first line of defense against infection.
- m. Name and explain the components of natural immunity.
- n. Contrast the functions of natural immunity and adaptive immunity.
- o. Correlate the cellular and humoral components of adaptive immunity.
- p. Contrast the functions and activities of natural immunity and adaptive immunity.
- q. Define the term hypersensitivity.
- r. Compare the basic differences among and give examples of types I, II, III, and IV hypersensitivity reactions.
- s. Discuss various types of antigens and associated reactions.
- t. Compare the three immunologically functional groups of leukocytes.
- u. Describe the five steps and general activities of phagocytosis.
- v. Compare various types of lymphocytes, and explain the function of each type.
- w. Compare examples of primary and secondary immunologic disorders.
- x. Describe the characteristics of agglutination.
- y. Explain the mechanism of particle agglutination.
- z. Name and compare the principles of latex agglutination, coagulation, liposome-mediated agglutination, direct bacterial agglutination, and hemagglutination.
- aa. Compare the characteristics of precipitation versus flocculation.
- bb. Explain the action and application of lysis in serologic reactions.
- cc. Compare the features and clinical applications of immunofluorescent assays, various enzyme immunoassays, polymerase chain reaction (PCR), Western blot, and DNA chip technology
- dd. Contrast the feature of the two phases of testing for antibody levels.

- ee. Define the term antibody titer, explain the procedure for the serial dilution of serum, and describe the clinical application of antibody titer.
- ff. Explain the principles of immunologic tests for pregnancy.
- gg. Integrate the pathophysiology and immunologic testing in infectious mononucleosis.
- hh. Explain the rationale and outcomes of syphilis testing.
  - ii. Integrate the pathophysiology and screening tests for antinuclear antibody (ANA) in systemic lupus erythematosus (SLE).
  - jj. Integrate the pathophysiology and laboratory testing for rheumatoid factor (RF) in patients with rheumatoid arthritis (RA).
- kk. Critique patient case histories, evaluate laboratory results, and correlate the pathophysiology of the defect with the diagnosis.
  - ll. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- mm. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.<sup>3</sup>

**16. Chapter 17 (1a-i, ii, iv, v, 1b-ii, iii, iv, v, vi, 2a-iii, 2c-i, ii, iii, iv, 2d-i, ii.)**

- a. Define the terms immunohematology, blood banking, and transfusion medicine.
- b. Compare the four categories of benefits and reasons for transfusions.
- c. Correlate various red blood cell components and derivatives used for transfusion, including packed red blood cells, plasma, and platelets, and explain the reasons for transfusion of each.
- d. Describe donor selection and blood processing, including assays for blood-borne infectious diseases.
- e. Explain proper labeling and storage of blood.
- f. Compare autologous and directed blood donations.
- g. Explain the role of antigens and antibodies in immunohematology.
- h. Define isoantibodies and immune antibodies and their roles in transfusion medicine.
- i. Describe the means of detecting antigen-antibody reactions in transfusion medicine, including the role of complement.
- j. Discuss the preparation and requirements of antisera.
- k. Define genotype and phenotype as used in immunohematology.
- l. Compare ABO red blood cell and serum typing procedures, including gel technology.
- m. Explain the concept of universal donors and recipients.
- n. Explain Landsteiner's rule and how it applies to transfusion medicine procedures.
- o. Differentiate what is meant by "Rh negative" and "Rh positive."
- p. Integrate Rh terminology and inheritance.
- q. Compare the direct and indirect antihuman globulin reaction (Coombs'test).
- r. List and explain the components of compatibility testing, including identification, ABO and Rh typing, screening for unexpected antibodies, and crossmatching.
- s. Differentiate various types of adverse effects of transfusion.
- t. Integrate the pathophysiology of hemolytic disease of the fetus and newborn (HDFN) with detection and prevention.
- u. Critique patient case histories, evaluate laboratory results, and correlate the pathophysiology of the defect with the diagnosis
- v. Perform each laboratory exercise and summarize the purpose and sources of error of each exercise.
- w. Demonstrate comprehension of this chapter content by completing the end of chapter review questions with a grade of 80% or above.

**Course Content:**

A general description of lecture/discussion topics included in this course are listed in the Learning Objectives / Specific Course Objectives sections of this syllabus.

### **Methods of Instruction/Course Format/Delivery:**

This course is offered in online format. Students will be fully responsible with keeping track of all assignments due dates, as well as being aware of the testing center times for the four mandatory proctored exams.

Students are expected to demonstrate basic competency in reading, writing, oral communication, math, and computer skills. Proficiency will be measured by quizzes, assignments, three regular examinations, and the comprehensive final exam.

### **Major Assignments / Assessments:**

The following items will be assigned and assessed during the semester and used to calculate the student's final grade.

#### **Assignments**

1. Assignments (including but not limited to Chapters 1-3, 7, 9,10-17)
2. Quizzes (Course Overview, Medical Technologies Handbook, Chapters 1-3, 5-17)

#### **Assessment(s):**

1. Proctored Exam #1 (Chapters 1-3,5,6)
2. Proctored Exam #2 (Chapters 7-9)
3. Proctored Exam #3 (Chapters 10-17)
4. Comprehensive Final Exam (1-3, 5-17)
5. Healthcare Spanish CE (See "Course Grades" for more information.)

### **Course Grade:**

The grading scale for this course is as follows:

- Homework – 20%
- Quizzes – 15%
- Exams – 50%
- Final Exam – 15%
- Total – 100%

(The Healthcare Spanish CE, will account for **20%** of your grade and will be factored in with the Exam Grades. This course concludes PRIOR to the end of the semester. Check your Spanish course for the exact date. All students are required to take this portion of the course!)

### **Texts, Materials, and Supplies:**

- Turgeon, Mary Louise. (2015). *Clinical Laboratory Science, 7th ed.* Maryland Heights, MO: Mosby. ISBN 9780323225458
- *Calculator*

### **Required Readings:**

- Turgeon, Mary Louise. (2015). *Clinical Laboratory Science, 7th ed.* Maryland Heights, MO: Mosby. ISBN 9780323225458

### **Recommended Readings:**

- Medical Dictionary

**Other:**

- For current texts and materials, use the following link to access bookstore listings: <http://www.panolacollegestore.com>
- For testing services, use the following link: <http://www.panola.edu/elearning/testing.html>
- If any student in this class has special classroom or testing needs because of a physical learning or emotional condition, please contact the ADA Student Coordinator in Support Services located in the Administration Building or go to <http://www.panola.edu/student-success/disability-support-services/> for more information.
- Withdrawing from a course is the student's responsibility. Students who do not attend class and who do not withdraw will receive the grade earned for the course.
- Student Handbook, *The Pathfinder*: <http://www.panola.edu/student-success/documents/pathfinder.pdf>

Academic Dishonesty:

Under no circumstances shall a student submit work that is not their own. Copying answers for study questions, cheating on exams and/or submitting laboratory results which are not your own are expressly prohibited.

Time Commitment:

According to "Hints on How to Succeed in College Classes" you should budget your time per week for this four-hour credit course as follows:

1. Reading assigned text 2 to 3 hours
2. Homework assignments 3 to 6 hours
3. Time for review and test preparation 3 hours
4. Total study time per week 9 to 13 hours PER WEEK

## SCANS CRITERIA

### 1) **Foundation skills are defined in three areas: basic skills, thinking skills, and personal qualities.**

- a) **Basic Skills:** A worker must read, write, perform arithmetic and mathematical operations, listen, and speak effectively. These skills include:
  - i) Reading: locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules.
  - ii) Writing: communicate thoughts, ideas, information, and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flow charts.
  - iii) Arithmetic and Mathematical Operations: perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.
  - iv) Listening: receive, attend to, interpret, and respond to verbal messages and other cues.
  - v) Speaking: Organize ideas and communicate orally.
- b) **Thinking Skills:** A worker must think creatively, make decisions, solve problems, visualize, know how to learn, and reason effectively. These skills include:
  - i) Creative Thinking: generate new ideas.
  - ii) Decision Making: specify goals and constraints, generate alternatives, consider risks, and evaluate and choose the best alternative.
  - iii) Problem Solving: recognize problems and devise and implement plan of action.
  - iv) Visualize ("Seeing Things in the Mind's Eye"): organize and process symbols, pictures, graphs, objects, and other information.
  - v) Knowing How to Learn: use efficient learning techniques to acquire and apply new knowledge and skills.
  - vi) Reasoning: discover a rule or principle underlying the relationship between two or more objects and apply it when solving a problem.
- c) **Personal Qualities:** A worker must display responsibility, self-esteem, sociability, self-management, integrity, and honesty.
  - i) Responsibility: exert a high level of effort and persevere toward goal attainment.
  - ii) Self-Esteem: believe in one's own self-worth and maintain a positive view of oneself.
  - iii) Sociability: demonstrate understanding, friendliness, adaptability, empathy, and politeness in group settings.
  - iv) Self-Management: assess oneself accurately, set personal goals, monitor progress, and exhibit self-control.
  - v) Integrity and Honesty: choose ethical courses of action.

### 2) **Workplace competencies are defined in five areas: resources, interpersonal skills, information, systems, and technology.**

- a) **Resources:** A worker must identify, organize, plan, and allocate resources effectively.
  - i) Time: select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
  - ii) Money: Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.
  - iii) Material and Facilities: Acquire, store, allocate, and use materials or space efficiently. Examples: construct a decision time line chart; use computer software to plan a project; prepare a budget; conduct a cost/benefits analysis; design an RFP process; write a job description; develop a staffing plan.
- b) **Interpersonal Skills:** A worker must work with others effectively.
  - i) Participate as a Member of a Team: contribute to group effort.
  - ii) Teach Others New Skills.
  - iii) Serve Clients/Customers: work to satisfy customer's expectations.

- iv) **Exercise Leadership:** communicate ideas to justify position, persuade and convince others, responsibly challenge existing procedures and policies.
- v) **Negotiate:** work toward agreements involving exchange of resources, resolve divergent interests.
- vi) **Work with Diversity:** work well with men and women from diverse backgrounds.

Examples: collaborate with a group member to solve a problem; work through a group conflict situation, train a colleague; deal with a dissatisfied customer in person; select and use appropriate leadership styles; use effective delegation techniques; conduct an individual or team negotiation; demonstrate an understanding of how people from different cultural backgrounds might behave in various situations.

- c) **Information:** A worker must be able to acquire and use information.

- i) **Acquire and Evaluate Information.**
- ii) **Organize and Maintain Information.**
- iii) **Interpret and Communicate Information.**
- iv) **Use Computers to Process Information.**

Examples: research and collect data from various sources; develop a form to collect data; develop an inventory record-keeping system; produce a report using graphics; make an oral presentation using various media; use on-line computer data bases to research a report; use a computer spreadsheet to develop a budget.

- d) **Systems:** A worker must understand complex interrelationships.

- i) **Understand Systems:** know how social, organizational, and technological systems work and operate effectively with them.
- ii) **Monitor and Correct Performance:** distinguish trends, predict impacts on system operations, diagnose deviations in systems' performance and correct malfunctions.
- iii) **Improve or Design Systems:** suggest modifications to existing systems and develop new or alternative systems to improve performance.

Examples: draw and interpret an organizational chart; develop a monitoring process; choose a situation needing improvement, break it down, examine it, propose an improvement, and implement it.

- e) **Technology:** A worker must be able to work with a variety of technologies.

- i) **Select Technology:** choose procedures, tools or equipment including computers and related technologies.
- ii) **Apply Technologies to Task:** understand overall intent and proper procedures for setup and operation of equipment.
- iii) **Maintain and Troubleshoot Equipment:** Prevent, identify, or solve problems with equipment, including computers and other technologies.

Examples: read equipment descriptions and technical specifications to select equipment to meet needs; set up and assemble appropriate equipment from instructions; read and follow directions for troubleshooting and repairing equipment.