Learning Outcomes

Cognitive Domain
1. Spell and define key terms
2. Identify the kinds of laboratories where medical assistants work and the functions of each
3. Identify the types of departments found in most large laboratories and give their purposes
4. Identify the types of personnel in laboratories and describe their jobs
5. Describe the medical assistant’s responsibility in the clinical laboratory
6. Define scope of practice for the medical assistant and comprehend the conditions for practice within the state that the medical assistant is employed
7. Identify body systems
8. Describe the panels defined by the American Medical Association for national standardization of nomenclature and testing and list the test results provided in each panel
9. Identify the equipment found in most small laboratories and give the purpose of each
10. Describe the parts of a microscope

Psychomotor Domain
1. Care for the microscope (Procedure 39-1)
**CONNECTIONS**

Circle the letter preceding the correct answer.

1. Laboratory test results are evaluated to determine the relative health of body systems or organs by comparison with:
   a. panels.
   b. constituents.
   c. reference intervals.
   d. calibration ranges.
   e. quality control ranges.

2. A large facility in which thousands of tests of various types are performed each day is a:
   a. hospital laboratory.
   b. POL.
   c. waived-testing laboratory.
   d. clinical chemistry laboratory.
   e. referral laboratory.

3. Specimen processors send portions of specimens used for testing by preparing:
   a. antibodies.
   b. aliquots.
   c. diagnostic tests.
   d. kits.
   e. panels.

4. Medical assistants frequently work with referral laboratory customer service personnel to:
   a. answer questions and provide special handling for specimens from their patients.
   b. suggest medication replacements.
   c. establish reference intervals for their patient results.
   d. obtain orders for laboratory tests.
   e. explain to the patient the reasons for performing the test.

5. How must a centrifuge be set up in order to work properly?
   a. Tubes must be equidistant.
   b. All tubes must have the same substance.
   c. Only one tube may be spun at a time.
   d. The lid must be down at all times.
   e. Spin must alternate every 30 minutes.

6. A Pap test specimen would be sent to which department for analysis?
   a. Histology
   b. Cytology
   c. Immunohematology
   d. Microbiology
   e. Clinical chemistry

7. Hematology includes the study of:
   a. etiology, diagnosis, and treatment of blood diseases.
   b. analysis of body fluids.
   c. the study of hormones.
   d. the study of the immune system and antibodies.
   e. the study of drugs.

8. Hemophilia is a:
   a. common skin pathogen.
   b. test performed on a urine specimen.
   c. blood clotting disease.
   d. shortage of red blood cells.
   e. type of leukemia.
9. The two most common tests performed in the coagulation laboratory are:
   a. red blood cell and white blood cell counts.
   b. prothrombin time and partial thromboplastin time.
   c. hemoglobin and hematocrit.
   d. iron and total iron-binding capacity.
   e. vitamin B₁₂ and folate.

10. The lipid panel tests are performed in:
    a. toxicology.
    b. urinalysis.
    c. cytology.
    d. coagulation.
    e. chemistry.

11. Mycology is the study of:
    a. protozoa and worms.
    b. viruses.
    c. bacteria.
    d. tuberculosis.
    e. fungi and yeasts.

12. The laboratory instrument used to prepare serum for laboratory testing is the:
    a. centrifuge.
    b. incubator.
    c. chemistry analyzer.
    d. cell counter.
    e. microscope diaphragm.

13. The test panel defined by the American Medical Association (AMA) for national standardization of nomenclature and testing used to test cholesterol, triglycerides, HDL, and LDL is the:
    a. comprehensive metabolic panel.
    b. basic metabolic panel.
    c. electrolyte panel.
    d. hepatic panel.
    e. lipid panel.

14. Sjögren syndrome, diagnosed using the antithyoglobulin antibody test, the rheumatoid arthritis test, and the antinuclear antibody test, is a disease of which body system?
    a. Endocrine
    b. Muscular
    c. Sensory
    d. Nervous
    e. Lymphatic

15. Klinefelter syndrome, diagnosed using serum and urine gonadotropin measurements, semen analysis, and chromosome studies, is a disease of which body system?
    a. Endocrine
    b. Lymphatic
    c. Nervous
    d. Reproductive
    e. Urinary

16. Osteomalacia and rickets, diagnosed using the comprehensive metabolic panel, vitamin D level, and the erythrocyte sedimentation rate, are diseases of which body system?
    a. Muscular
    b. Skeletal
    c. Nervous
    d. Respiratory
    e. Endocrine

17. Meningitis, diagnosed using cerebrospinal fluid levels of WBCs, protein, glucose, and a cerebrospinal fluid culture, is a disease of which body system?
    a. Muscular
    b. Skeletal
    c. Nervous
    d. Respiratory
    e. Endocrine
18. A graduate of an associate (2-year) degree program (or equivalent) in medical laboratory science who is nationally certified and performs specimen testing is a:

a. cytologist.
b. phlebotomist.
c. medical laboratory technician.
d. medical laboratory technologist.
e. laboratory assistant.

19. A technician trained to process and evaluate tissue samples, such as biopsy or surgical samples, is a:

a. medical laboratory technician.
b. histologist.

c. cytologist.
d. medical laboratory technologist.
e. pathologist.

20. What information is required on a laboratory requisition form?

a. Date and time the physician ordered the test(s)
b. Temperature of the room at the time of specimen collection
c. Credit card number
d. Birth date and gender of patient
e. Signature of patient

Matching

Match each key term with the correct definition.

Key Terms

21. ____ aliquots
22. ____ analytes
23. ____ antibodies
24. ____ antigen
25. ____ anticoagulant
26. ____ autoimmunity
27. ____ biohazard
28. ____ centrifugation
29. ____ Centers for Medicare and Medicaid Services (CMS)
30. ____ coagulation
31. ____ coagulopathies
32. ____ cytogenetics
33. ____ cytology

Definitions

a. substance or constituent for which a laboratory conducts testing
b. anything that prevents or delays blood clotting
c. diseases associated with abnormal blood clotting functions
d. specimens requiring a legal chain of custody
e. testing based on the reactions of antibodies in the presence of antigens
f. proteins formed in the body in response to foreign substances
g. substance that, when introduced into the body, cause the development of immune responses
h. disorder of the immune system in which parts of the immune system fail to provide an adequate response
i. disorders of the immune system in which the immune system attacks its own host's body
j. disorders in which the immune system responds inappropriately to harmless compounds or responds too intensely
k. study of the microscopic structure of tissue; samples of tissue are prepared, stained, and evaluated under a microscope to determine whether disease is present
l. involves a wide variety of procedures used in donor selection, component preparation and use, and techniques used to detect antigen/antibody reactions which may adversely affect a patient receiving a transfusion
m. study of the microscopic structure of cells; individual cells in body fluids and other specimens are evaluated microscopically for the presence of disease such as cancer
34. ___ for cause  
35. ___ hematology  
36. ___ histology  
37. ___ hypersensitivities  
38. ___ immunodeficiency  
39. ___ immunohematology  
40. ___ immunology  
41. ___ kit  
42. ___ microbiology  

n. genetic structure of the cells obtained from tissue, blood, or body fluids, such as amniotic fluid, are examined or tested for chromosome deficiencies related to genetic disease  
o. the process of separating blood or other body fluid cells from liquid components  
p. portions of the original specimen  
q. substance that is a potential carrier of blood-borne pathogens  
r. require the use of test panels created by the AMA  
s. the study of blood and blood forming tissues  
t. packaged set of supplies needed to perform a test  
u. the study of the blood's ability to clot  
v. the study of pathogen identification and antibiotic susceptibility determination

**MATCHING**

Match each key term with the correct definition.

<table>
<thead>
<tr>
<th>Key Terms</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>43. oncology</td>
<td>a. acceptable ranges for a healthy population</td>
</tr>
<tr>
<td>44. panels</td>
<td>b. designed to ensure thorough patient care</td>
</tr>
<tr>
<td>45. pathogen</td>
<td>c. procedures to monitor and evaluate testing procedures, supplies, and equipment to ensure accuracy in laboratory performance</td>
</tr>
<tr>
<td>46. physician office laboratory (POL)</td>
<td>d. standard groups of laboratory tests organized to effectively evaluate disease processes or organ systems</td>
</tr>
<tr>
<td>47. plasma</td>
<td>e. contains instructions and critical details for performing a test</td>
</tr>
<tr>
<td>48. procedure manual</td>
<td>f. a handbook that contains test methods and other information needed to perform testing, suggested by the United States Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) as a valuable resource for CW sites</td>
</tr>
<tr>
<td>49. product insert</td>
<td>g. top layer of a whole blood specimen if the specimen was anticoagulated and not allowed to clot</td>
</tr>
<tr>
<td>50. quality assurance (QA)</td>
<td>h. the study and medical treatment of cancer</td>
</tr>
<tr>
<td>51. quality control (QC)</td>
<td>i. a limited testing laboratory in a medical office</td>
</tr>
<tr>
<td>52. reference intervals</td>
<td>j. a large facility in which thousands of tests of various types are performed each day</td>
</tr>
<tr>
<td>53. referral laboratory</td>
<td>k. blood containing all its cellular and liquid components</td>
</tr>
<tr>
<td>54. serum</td>
<td>l. disease-causing microorganism</td>
</tr>
<tr>
<td>55. specimens</td>
<td>m. the liquid portion of the blood after the blood has been allowed to clot</td>
</tr>
<tr>
<td>56. surgical pathology</td>
<td>n. examination of the physical, chemical, and microscopic properties of urine</td>
</tr>
</tbody>
</table>
57. ___ toxicology
58. ___ unitized test device
59. ___ urinalysis
60. ___ whole blood

o. the pathologist in this department gives a diagnosis of the presence or absence of disease in tissue that is surgically removed from a patient
p. used for a single test and discarded after testing
q. small portions of anything used to evaluate the nature of the whole
r. branch of chemistry that studies the amounts and identification of chemicals foreign to the body

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**MATCHING**

Match the following panel(s) defined by AMA and mandated by CMS to the correct analytes. Place the letter preceding the panel name on the line next to the analyte that it includes. There may be more than one correct panel name for some analytes. You must list all the corresponding panels for a correct answer.

<table>
<thead>
<tr>
<th>Analytes</th>
<th>Panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>61. _______ Glucose</td>
<td>a. Comprehensive metabolic</td>
</tr>
<tr>
<td>62. _______ Sodium</td>
<td>b. Basic metabolic</td>
</tr>
<tr>
<td>63. _______ Albumin</td>
<td>c. Electrolyte</td>
</tr>
<tr>
<td>64. _______ Cholesterol</td>
<td>d. Hepatic function</td>
</tr>
<tr>
<td>65. _______ Potassium</td>
<td>e. Lipid</td>
</tr>
<tr>
<td>66. _______ Total protein</td>
<td></td>
</tr>
<tr>
<td>67. _______ Triglycerides</td>
<td></td>
</tr>
<tr>
<td>68. _______ Chloride</td>
<td></td>
</tr>
<tr>
<td>69. _______ Alkaline phosphatase (ALP)</td>
<td></td>
</tr>
<tr>
<td>70. _______ HDL</td>
<td></td>
</tr>
<tr>
<td>71. _______ CO₂</td>
<td></td>
</tr>
<tr>
<td>72. _______ Alanine aminotransferase (ALT)</td>
<td></td>
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<tr>
<td>73. _______ LDL</td>
<td></td>
</tr>
<tr>
<td>74. _______ Creatinine</td>
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<tr>
<td>75. _______ Direct bilirubin</td>
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</tbody>
</table>

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**IDENTIFICATION**

Each of the medical assistants below needs a laboratory test completed for a patient. Review the task that must be performed and then decide which laboratory department should handle each task.

76. Ericka needs to send in blood for a complete blood count.

77. Kwon needs results of the chemical properties of a patient’s urine.
78. Darren has to send a patient to the lab for glucose testing.

79. Don has a mole removed and sent to the lab for analysis.

80. Rochelle collects a clean catch urine for culture.

For each list of organs, name the corresponding body system.

81. Bone marrow, thymus gland, spleen, lymph nodes:

82. Heart, blood vessels:

83. Small and large intestines, rectum, anus:

84. Heart, arteries, capillaries, veins:

85. Mouth, esophagus, stomach, liver, gallbladder:

86. Skin, hair, nails, sweat glands:

87. Hypothalamus, pituitary, thyroid, parathyroids:

88. Smooth, cardiac, and skeletal muscles:

89. Sight, hearing, feeling, smell, taste, balance:

90. Bone, bone marrow, joints, teeth:

91. Ducts, lymph nodes:

92. Brain, spinal cord, nerves:

93. Kidneys, ureter, urethra:

94. Penis, testes, vagina, uterus, ovaries:

95. Nose, pharynx, larynx:

96. Pancreas, small intestine, large intestine:

97. Adrenals, pancreas, pineal body, ovaries, testes:

98. Ligaments, cartilage:

99. Bronchioles, lungs:

100. Palatine tonsil, thymus gland:

101. Trachea, bronchi, alveoli:
## IDENTIFICATION

### COG

#### Grade: ___________

102. For each disease or syndrome given, fill in the corresponding body system followed by laboratory tests used in diagnosing that disease or syndrome. Use Table 39-1, “Body Systems and Laboratory Testing,” in the textbook for assistance.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Body System</th>
<th>Laboratory Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Gout</td>
<td></td>
<td></td>
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<tr>
<td>b. Sarcoidosis</td>
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<td></td>
</tr>
<tr>
<td>c. Tonsillitis</td>
<td></td>
<td></td>
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<tr>
<td>d. Myasthenia gravis</td>
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<td></td>
</tr>
<tr>
<td>e. Colorectal cancer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Menopause</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Pancreatitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Myocardial infarction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Sjögren syndrome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Tuberculosis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## SHORT ANSWER

### COG

#### Grade: ___________

103. What items are included in the patient database and why?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

104. Why does the laboratory need the patient’s birth date and gender?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
105. How does the laboratory use the date and time of collection?

106. How does the laboratory use the physician’s name and address?

107. What other specimen information may be required?

108. List six good laboratory practices for POLs performing POC testing.
109. The physician you work for is beginning his practice and has asked you to purchase the laboratory equipment the office will need. List six pieces of equipment found in most POLs and their functions.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td></td>
</tr>
</tbody>
</table>

CASE STUDIES FOR CRITICAL THINKING

1. Jacob works for a large primary care practice and is the medical assistant assigned to the laboratory. When Jacob arrives in the laboratory, he finds 12 urine samples and requisitions waiting for testing. After quality control results for urine tests are acceptable, Jacob prepares to perform the urine tests. He reads each requisition to set up appropriate testing supplies. He notices that one urine specimen has no patient identification of any kind. How should Jacob handle this specimen?

2. Dr. Oyakawa calls to say he will be 30 minutes late. His medical assistant, Paula, brings Dr. Oyakawa’s first patient to the laboratory with a test requisition. This is the patient’s first visit with Dr. Oyakawa. Dr. Oyakawa has not called in a verbal order for this patient. Paula fills out the requisition in front of you and selects tests for you to perform. How do you respond to Paula?
3. This is your first day working in the laboratory at a university outpatient clinic. You are the only person working in the laboratory. You completed your orientation and training prior to today, but today is your first day being responsible for patient testing. Dr. Rayshawdhury brings a throat swab to the laboratory and requests a STAT streptococcus test. You know that the test is performed using a waived-testing kit. You open the test box expecting to use the package insert as a guide for performing the test, but the package insert is not there. You look for the Laboratory Manual and cannot locate one. How do you obtain directions for performing the test?
**PROCEDURE 39-1  Care for the Microscope**

Name: ___________________________  Date: ________  Time: ________  Grade: ________

**EQUIPMENT/SUPPLIES:**  Lens paper, lens cleaner, gauze, mild soap solution, microscope, hand disinfectant, surface disinfectant

**STANDARDS:**  Given the needed equipment and a place to work, the student will perform this skill with _________% accuracy in a total of ________ minutes. *(Your instructor will tell you what the percentage and time limits will be before you begin practicing.)*

**KEY:**  
4 = Satisfactory  
0 = Unsatisfactory  
NA = This step is not counted

<table>
<thead>
<tr>
<th>PROCEDURE STEPS</th>
<th>SELF</th>
<th>PARTNER</th>
<th>INSTRUCTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wash your hands.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Assemble the equipment.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. If you need to move the microscope, carry it in both hands, one holding the base and the other holding the arm.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Clean the optical areas.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>a. Place a drop or two of lens cleaner on a piece of lens paper.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Wipe each eyepiece thoroughly with the lens paper. Do not touch the optical areas with your fingers. Wipe each eyepiece with lens paper and lens cleaner.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Wipe each objective lens, starting with the lowest power and continuing to the highest power (usually an oil immersion lens). If the lens paper appears to have dirt or oil on it, use a clean section of the lens paper or a new piece of lens paper with cleaner. Wipe each objective lens with lens paper and lens cleaner. Clean the oil objective last so you do not carry its oil to the other objective lenses.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Using a new piece of dry lens paper, wipe each eyepiece and objective lens so that no cleaner remains.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. With a new piece of lens paper moistened with lens cleaner, clean the condenser and illuminator optics. Clean and dry the condenser and illuminator optics.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Clean the areas other than the optics.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>a. Moisten gauze with mild soap solution or use an alcohol wipe and wipe all areas other than the optics, including the stage, base, and adjustment knobs.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Moisten another gauze with water and rinse the washed areas.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. To store the cleaned microscope, ensure that the light source is turned off. Rotate the nosepiece so that the low-power objective is pointed down toward the stage. Cover the microscope with the plastic dust cover that came with it or a small trash bag.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
CALCULATION

Total Possible Points: ________

Total Points Earned: ________ Multiplied by 100 = ________ Divided by Total Possible Points = ________ %

PASS          FAIL          COMMENTS:

☐             ☐             

Student’s signature _____________________________ Date ______

Partner’s signature _____________________________ Date ______

Instructor’s signature ___________________________ Date ______