



MLTS 212- Urinalysis and Body Fluids

1 CREDIT

SYLLABUS

CATALOG DESCRIPTION

Physical, chemical and microscopic study of urine with emphasis on the changes exhibited in disease with related renal anatomy and physiology. Current instrumentation will be covered. Analysis of other body fluids as spinal and pleural fluid will be included.

Prerequisites: Acceptance into the Medical Laboratory Technology Program

Semester Offered: Summer

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. Perform and report a complete urinalysis according to protocol with minimal supervision.(T,I,A)
2. Recognize normal and abnormal physical and chemical findings and correlate these results with microscopic findings.(T,I, A)
3. Correlate abnormal urinary findings with possible disease states.(T,I,A)

Upon completion of the lecture series and laboratory, the student will be able to satisfy the 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

Chapter One

1. Employ safety guidelines outlined in the MLT Handbook 100% of the time. (Level 3)

Chapter Two

1. Explain the function and structure of the organs of the urinary system including: Kidney, bladder, ureter, urethra. (Level 2)
2. 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)
3. Describe how urine is formed. (Level 2)
4. Discuss the functions and regulation of the rennin-angiotensin-aldosterone system. (Level 2)
5. List the constituents that normally appear in the urine. (Level 1)
6. List the factors affecting glomerular filtration. (Level 1)
7. Explain how the glomerular filtrate is generally considered to be essentially the same as blood plasma. (Level 2)
8. Differentiate between active and passive transport in relation to renal concentration. (Level 4)
9. Explain the function of antidiuretic hormone in the concentration of urine. (Level 2)
10. Describe the role of tubular secretion in maintaining acid base balance. (Level 2)
11. Identify the laboratory procedures used to evaluate glomerular filtration, tubular reabsorption and secretion, and renal blood flow. (Level 2)
12. Discuss the advantages and disadvantages in using urea, insulin, creatinine, beta2 microglobulin, cystatin C, and radionucleotides to measure glomerular filtration. (Level 2)
13. Define osmolality of a solution and describe the methods used to determine osmolality in the clinical laboratory. (Level 1)

Chapter Three

1. List three major organic and three major inorganic constituents of urine. (Level 1)
2. Describe a method for determining whether a questionable fluid is urine. (Level 2)
3. Recognize normal and abnormal daily urine volumes. (Level 2)
4. State four possible reasons why a laboratory would reject a urine specimen. (Level 2)
5. State the value of urinalysis as a routine diagnostic procedure. (Level 2)
6. List three basic rules for safe handling of urine specimens. (Level 1)
7. Discuss five methods for preserving urine specimens, include the advantages and disadvantages for each. (Level 2)
8. Describe eight changes that may take place in a urine specimen that remains at room temperature for more than two hours. (Level 2)
9. Differentiate between the following abnormalities of urine volume including: polyuria, anuria, oliguria. (Level 2)
10. For each of the following types of specimens:
11. Discuss when each should be ordered and
12. Describe the PROCEDURE used for collection of each:
13. Random, fasting, first voided morning, post prandial, 24 hour, 12 hour, clean void, catheterized.
14. (Level 2)

Chapter Four

1. List the common terminology to report normal urine color. (Level 1)
2. Discuss the relationship of urochrome and normal urine color and to specific gravity. (Level 2)
3. Identify the colors which are commonly associated with abnormal urine and discuss the pathological cause for each. (Level 2)
4. Discuss the significance of cloudy red urine and clear red urine. (Level 2)
5. State possible causes for urine turbidity in a sample that is not fresh. (Level 1)
6. Identify possible causes for abnormal urinary foam. (Level 2)
7. Identify the odors commonly associated with abnormal urine and state the cause for each.
8. List the common terminology used to report clarity of urine. (Level 1)
9. List three pathologic and four nonpathologic causes of cloudy urine. (Level 1)
10. Define specific gravity and discuss its significance in a routine urinalysis. (Level 1)
11. Describe the principles of the urinometer, refractometer and harmonic oscillation densitometry methods for determine specific gravity. (Level 2)
12. Identify possible causes for abnormal specific gravities of urine. (Level 2)
13. Discuss the correction needed to compensate for high molecular substances as glucose or protein in determining the true specific gravity. Given the concentrations of these substances calculate the correction. (Level 2)

Chapter Five

1. Employ the proper technique for performing chemical tests on urine by reagent strip and give possible errors if this technique is not followed. (Level 3)
2. List four causes of premature deterioration of reagent strips and discuss how to avoid each. (Level 1)
3. Employ five quality-control procedures routinely performed with reagent strip testing. (Level 3)
4. Explain the clinical significance for each of the following urine chemical tests: Nitrite, Bilirubin, Glucose, Leukocytes, Ketones, Protein, Urobilinogen, pH, Blood, Specific gravity. (Level 2)

5. Explain the principle of testing used in the reagent strips for: Nitrite, Bilirubin, Glucose, Leukocytes, Ketones, Protein, Urobilinogen, pH, Blood, Specific gravity. (Level 2)
6. Define the practical sensitivity for each test listed above. (Level 1)
7. Discuss the interfering substances for each test listed above and include false positives and/or false negatives appropriate for each analyte. (Level 2)
8. For each of the following chemical tests, discuss what substances are being detected, interfering substances, and interpretation for each: Heat and acetic acid test, Methyl Red, Bromthymol Blue, Sulfosalicylic acid test, Glucose oxidase, Benedict's test, Diazonium salt, Ehrlich's test, Ictotest, Nitroprusside, Tetrabromophenol blue, Potassium iodide, P-diethylaminobenzaldehyde. (Level 2)
9. Differentiate among prerenal, renal, and post renal proteinuria, and give clinical examples of each. (Level 4)
10. Describe the unique solubility characteristics of Bence Jones protein and discuss a screening test for this protein. (Level 2)
11. Discuss microalbuminuria including significance, reagent strip tests and principles. (Level 2)
12. Discuss the renal threshold levels for glucose. (Level 2)
13. Describe the copper reduction method for detection of urinary reducing substances and list possible causes of interference. Interpret matching and non-matching results between the glucose oxidase and the copper reduction tests for glucose. (Level 2)
14. List three ketone bodies appearing in urine and three causes of ketonuria. (Level 1)
15. Differentiate between hematuria, hemoglobinuria and myoglobinuria with regard to the appearance of urine and serum and clinical significance of each. (Level 4)
16. Compare the chemical reactions of urinary bilirubin and urobilinogen in the diagnosis of bile duct obstruction, liver disease, and hemolytic disorders. (Level 4)

Chapter Six

1. List the physical and chemical parameters included in macroscopic urine screening and appraise their significance in determining the need for a urine microscopic examination. (Level 4)
2. Describe the recommended methods for standardizing specimen preparation and volume, centrifugation, sediment preparation, volume and examination, and reporting of results. (Level 2)
3. State the purpose the Sternheimer-Malbin, acetic acid, toluidine blue, Sudan III, Gram, Hansel and Prussian blue stains in the examination of the urine sediment. (Level 1)
4. Describe the basic principles of bright-field, phase-contrast, polarizing, dark-field, fluorescence, and interference – contrast microscopy and explain how each may be used in urine sediment examination. (Level 2)
5. Discuss the advantages of commercial systems over the glass- slide method for sediment observation. (Level 2)
6. List eight formed elements found in urinary sediment. (Level 1)
7. Differentiate between normal and abnormal sediment constituents. (Level 4)
8. Identify when and explain why a urine specimen should be referred for cyto-diagnostic testing. (Level 2)
9. Explain proper reporting procedure for casts and cells found in the urine. (Level 2)
10. Describe the process of cast formation. (Level 2)
11. Identify the following casts and discuss the clinical significance of each:

-Hyaline cast	-RBC cast	-Mixed cast
-WBC cast	-Epithelial cell cast	-Fatty cast
-Granular cast	-Waxy cast	-Broad cast
12. Differentiate the following kinds of cells and discuss the clinical significance of each:

-WBC	-Epithelial cells	-Glitter cells	-Renal Tubular
-RBC	-Squamous	-Transitional	(Level 4)
13. List and identify the normal crystals found in acid urine. (Level 2)
14. List and identify the normal crystals found in alkaline urine. (Level 2)
15. Describe and discuss the significance of cystine, cholesterol, leucine, tyrosine, bilirubin, sulfonamide, radiographic dye and ampicillin crystals when found in the urine. (Level 2)
16. List four groups of microorganisms which may appear in the urine. (Level 1)
17. Differentiate between actual urine sediment constituents and artifacts. (Level 4)
18. Correlate physical and chemical urinalysis results with microscopic observations and analyze discrepancies. (Level 4)

Chapter Eight

1. Differentiate among renal diseases of glomerular, tubular, interstitial and vascular origin. (Level 4)
2. Describe the process by which immunologic damage is produced to the glomerular membrane. (Level 2)
3. Define and compare and contrast glomerulonephritis, chronic glomerulonephritis and end-stage renal disease include pathology and laboratory findings. (Level 4)
4. Describe the characteristic clinical symptoms, etiology and urinalysis findings in acute poststreptococcal and rapidly progressive glomerulonephritis, Goodpasture syndrome, Wegners granulomatosis and Henoch-Schonlein purpura. (Level 2)
5. Relate laboratory results associated with the nephrotic syndrome to the disease process. (Level 4)
6. Discuss two causes of acute tubular necrosis. (Level 2)
7. Describe the expected urinary sediment most diagnostic for renal tubular damage. (Level 2)
8. Differentiate among Fanconi syndrome, Alport syndrome, and renal glucosuria. (Level 4)
9. Differentiate between diabetic nephropathy and nephrogenic diabetes insipidus. (Level 4)
10. Compare and contrast the urinalysis results in patients with cystitis, pyelonephritis and acute interstitial nephritis. (Level 4)

11. Discuss the differences of urinary results for pre-renal, renal and post renal acute renal failure. Explain the reasons for these differences. (Level 2)
12. Discuss the formation of renal calculi, composition of renal calculi and patient management techniques. (Level 2)

Chapter Nine

1. Explain the abnormal accumulation of metabolites in the urine in terms of overflow and renal disorders. (Level 2)
2. Discuss the importance and procedures for newborn screening. (Level 2)
3. List and describe the urine tests used for screening urinary:
4. -Phenylketonuria -Tyrosyluria
5. -Alkaptonuria -Melanuria (Level 2)
6. Given the list above, name the metabolic defect for each and describe the clinical manifestations produced in each. (Level 2)
7. Describe the basic laboratory observation that has relevance in maple syrup disease. (Level 2)
8. Discuss the significance of ketonuria in a newborn. (Level 2)
9. Differentiate between the presence of urinary indican owing to intestinal disorders and Hartnup disease. (Level 4)
10. Discuss the significance of increased urinary 5-hydroxyindolacetic acid. (Level 2)
11. Differentiate between cystinuria and cystinosis including the differences that are found during analysis of the urine and disease process. (Level 4)
12. Discuss the significance of increased uric acid crystals in newborn urine. (Level 2)
13. Explain the need for performing test for urinary-reducing substances on all newborns. (Level 2)
14. Discuss the clinical significance of the disorders of the Phenylalanine-Tyrosine Pathway. (Level 2)
15. Describe the metabolism of tryptophan, cystine and homocystine. (Level 2)
16. Explain two screening test for porphyrinuria. (Level 2)
17. List three types of mucopolysaccharides. (Level 2)

Chapter Eleven

1. List the structures involved in sperm production and discuss the function for each. (Level 2)
2. Describe the four components of semen with regard to source and function. (Level 2)
3. Describe the normal appearance of semen and describe three abnormalities in semen. (Level 2)
4. Discuss two possible cause of low semen volume. (Level 2)
5. Discuss the significance of semen liquefaction and viscosity. (Level 2)
6. Calculate a sperm concentration and count when provided with the number of sperm counted, the dilution, the area of counting chamber used, and the ejaculate volume. (Level 2)
7. Explain the significance of round cells. (Level 2)
8. Describe the two parameters considered when evaluating sperm motility. (Level 2)
9. Describe the appearance of normal sperm, including structures and their functions. (Level 2)
10. Differentiate between routine and strict criteria for evaluation of sperm morphology. (Level 4)
11. Given an abnormal result in the routine semen analysis, distinguish additional tests that might be performed. (Level 4)
12. Describe the two routinely used methods for detection of antibodies to sperm. (Level 2)
13. Describe two methods for identifying a questionable fluid as semen. (Level 2)
14. Restate the World Health Organization normal values for routine and follow-up semen analysis. (Level 2)
15. Discuss the types and significance of sperm function tests. (Level 2)
16. Describe the methods of quality control appropriate for semen analysis. (Level 2)

Chapter Twelve

1. Describe the formation and function of synovial fluid. (Level 2)
2. List the five most diagnostic tests performed on synovial fluid. (Level 1)
3. Describe the appearance of synovial fluid in normal and abnormal states. (Level 2)
4. Discuss the normal and abnormal cellular composition of synovial fluid. (Level 2)
5. List and describe six crystals found in synovial fluid. (Level 2)
6. Explain the differentiation of monosodium urate and calcium pyrophosphate crystals using polarized and compensated polarized light. (Level 2)
7. Discuss the clinical significance of glucose and lactate tests results on synovial fluid. (Level 2)
8. List four genera of bacteria most frequently found in synovial fluid. (Level 1)
9. Describe the relationship of serologic testing of serum to joint disorders. (Level 2)

Chapter Thirteen

1. Describe the normal formation of serous fluid. (Level 2)
2. Differentiate between a transudate and exudate, including etiology, appearance, and laboratory testing. (Level 4)
3. Differentiate among peritoneal fluid, pericardial fluid, pleural fluids to location and clinical significance. (Level 4)
4. Instrumentation
5. Discuss and appraise the use of automation in the urinalysis laboratory including automated chemistry strip readers and automated microscopic cell classifiers. Include the principle of operation for each.
6. (Level 4)

PSYCHOMOTOR SKILLS OBJECTIVES

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

1. Operate the Clinitek according to protocol and analyze dipsticks accurately in a safe and timely manner. (Level 3)
2. Operate the microscope to successfully visualize and identify and differentiate formed elements, crystals, and contaminants using brightfield, phase, and polarizing views. (Level 4)

3. Analyze and report 3 complete urinalysis according to protocol with minimal supervision within two hours and results should agree within 95% limits of established sample values. (Level 4)

AFFECTIVE DOMAIN OBJECTIVES

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

1. Demonstrates a professional attitude by:
 - a. adhering to dress code described in student handbook, including wearing nametag at all times and awareness of personal hygiene.
 - b. being able to locate and use appropriate safety equipment including emergency exits, fire alarms, eyewash, shower.
 - c. utilizes PPE as appropriate and according to site protocol.
 - d. safe and effective use of laboratory equipment.
2. Demonstrates a good work ethic by being punctual and\ finishing assigned work on time.
3. Demonstrates an ability to organize and prioritize work as demonstrated by completing assignments in lecture and laboratory within allotted time.
4. Demonstrates a respect for peers and is a team worker by cleaning work area and replenishing regents and supplies as needed.
5. Demonstrates excellent correlation between theory and practicum by reporting out results that are reasonable and appropriate in relation to each other and/or a pathological condition.