Course Number and Title: MLT 220 Clinical Chemistry I

Campus Location:
Georgetown

Effective Date:
2022-51

Prerequisite:
CHM 151 or CHM 111, BIO 121

Co-Requisites:
None

Course Credits and Hours:
4.00 credits
3.00 lecture hours/week
3.00 lab hours/week

Course Description:
This course covers the qualitative and quantitative measurement of biochemical constituents in body fluids and their significance to disease. Topics include analysis of urine, semen, stool and body fluids and how results correlate to disease states. Laboratory exercises incorporate sample collection and preparation, safety, quality control, and instrumentation.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
Lab Coat, Gloves, Permanent Marker

Schedule Type:
Classroom Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Explain how laboratory tests correlate with various diseases and conditions for each anatomy and physiology system. (CCC 2; PGC 6)
2. Identify, describe, and collect the types of samples used in clinical chemistry, and identify the variables that can adversely affect laboratory results. (CCC 5; PGC 1, 2, 6)
3. Perform testing of analytes using a variety of methods to include both manual and automated methods. (CCC 1, 2, 3, 4; PGC 1, 2, 3, 4)
4. Discuss the scientific principles, test methodologies, and proper use of instrumentation as well as safety measures and personal protective equipment to be used in the clinical chemistry laboratory. (CCC 2, 5; PGC 1, 2, 3, 4, 5, 6)
5. List the major normal and abnormal constituents of body fluids such as blood, urine, cerebrospinal fluid (CSF), synovial fluid, amniotic fluid, seminal fluid, peritoneal fluid, pericardial fluid, and pleural fluid. (CCC 2, 5; PGC 1, 2, 6)
6. Use medical terminology and abbreviations in the proper context. (CCC 1; PGC 7)
7. Using both patient and hypothetical data, calculate laboratory reference ranges and test results from various formulas. (CCC 6; PGC 4)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Explain how laboratory tests correlate with various diseases and conditions for each anatomy and physiology system.
    1. Discuss the physiologic mechanisms of glomerular filtration, tubular reabsorption, tubular secretion, and renal blood, and identify the laboratory procedures used to evaluate these renal functions.
    2. Discuss the advantages and disadvantages in using different methods for the measurement of glomerular filtration.
    3. Discuss the clinical significance of the creatinine clearance test.
    4. Define *osmolarity,* and discuss its relationship to urine concentration.
    5. State the primary causes of acute glomerulonephritis, and describe the major urinalysis findings.
    6. Discuss the chronic forms of glomerular disease, nephritic syndrome, and renal failure, including the renal functions affected and significant urinalysis results.
    7. Describe the urine sediment in various renal diseases.
    8. Discuss the significance of abnormally colored urine samples and their pathological causes.
    9. Discuss the significance of abnormally high specific gravity readings.
    10. Describe clinical significance of proteinuria, glycosuria, and ketonuria.
    11. Differentiate between hematuria, hemoglobinuria, and myoglobinuria, and explain the clinical significance of each.
    12. Describe the clinical significance of bilirubin in the urine and its correlation to bile duct obstruction, liver disease, and hemolytic disorders.
    13. Describe the clinical significance of laboratory tests (pH, osmolality, electrolytes, and arterial blood gases) as well as correlate the findings

with diseases and conditions affecting acid-base balance.
14. Describe the clinical significance of laboratory tests (glucose, glycosylated hemoglobin, and glucose tolerance) as well as correlate the findings with diseases and conditions that affect carbohydrate metabolism.

2. Identify, describe, and collect the types of samples used in clinical chemistry, and identify the variables that can adversely affect laboratory results.
    1. Explain the different specimens used in the clinical chemistry laboratory: serum, plasma, urine, CSF, synovial fluid, amniotic fluid, pleural fluid, peritoneal fluid, pericardial fluid, and semen.
    2. List three basic rules for specimen handling, and explain their importance.
    3. Discuss methods for preserving urine specimens, including their advantages and disadvantages.
    4. Describe the type of specimen needed to obtain optimal results when a specific urinalysis procedure is requested, and explain when to refuse a specimen.
    5. Describe how specimen integrity can affect laboratory results.
    6. Identify the proper use of sample collection devices used in the laboratory.
    7. Perform specimen collection for both urine and blood samples.
3. Perform testing of analytes using a variety of methods to include both manual and automated methods.
    1. Instruct a patient in the correct procedure for collecting a midstream clean-catch specimen and a timed urine specimen.
    2. Identify causes of premature deterioration of reagent strips, and explain how to avoid them.
    3. Prepare the necessary reagents or instrumentation for the stated procedures.
    4. Describe the methodology of stated procedures, sources of error, and clinical applications of the procedure.
    5. State the normal values for the parameters measured in the stated procedures.
    6. Perform urinalysis dipstick testing for chemical analysis within acceptable limits.
    7. Perform microscopic examination of urine within acceptable limits.
4. Discuss the scientific principles, test methodologies, and proper use of instrumentation as well as safety measures and personal protective equipment to be used in the clinical chemistry laboratory.
    1. Describe the proper technique for performing chemical tests on urine by reagent strip, and identify possible errors if proper technique is not followed.
    2. Describe the principles used for chemical testing of urine (pH, specific gravity, protein, glucose, ketones, bilirubin, blood, nitrite, urobilinogen, and leukocyte esterase), and list any sources of interference for each.
    3. Describe the testing methods used to screen urine samples for inborn errors of metabolism as well as confirmation tests for these disorders.
    4. Describe basic principles in operating an automated analyzer.
    5. Describe essential safety practices to be used in the clinical chemistry laboratory.
    6. Name the components of the personal protective equipment standard.
    7. Demonstrate proper use of personal protective equipment in the clinical chemistry laboratory.
    8. Demonstrate proper use of standard precautions in the clinical chemistry laboratory.
    9. Demonstrate proper use of a refractometer, microscope, centrifuge and an automated analyzer.
5. List the major normal and abnormal constituents of body fluids such as blood, urine, cerebrospinal fluid (CSF), synovial fluid, amniotic fluid, seminal fluid, peritoneal fluid, pericardial fluid, and pleural fluid.
    1. List three major chemical constituents of urine.
    2. Describe a method for determining whether a questionable fluid is urine.
    3. Recognize normal and abnormal daily urine volumes.
    4. Recognize and describe the appearance of normal and abnormal crystals in urine and other body fluid samples.
    5. Recognize and describe the appearance of casts, oval fat bodies, and epithelium found in urine.
6. Use medical terminology and abbreviations in the proper context.
    1. Define the common terms encountered in urinalysis, and use them in proper context.
    2. Recognize common abbreviations associated with urinalysis, and tell what they represent.
    3. List the common terminology used to report normal urine color and appearance.
    4. List the common terms encountered in clinical chemistry, and use them in proper context.
    5. Recognize common abbreviations associated with clinical chemistry, and tell what they represent.
7. Using both patient and hypothetical data, calculate laboratory reference ranges and test results from various formulas.
    1. Calculate total cell counts from manually performed cell counts.
    2. Calculate % viability of sperm from prepared slide.
    3. Calculate the correction needed to compensate for these high molecular weight substances in the urinometer specific gravity reading, given the concentration of glucose and protein in a specimen.

Evaluation Criteria/Policies:
The grade will be determined using the Delaware Tech grading system:

90	–	100	=	A
80	–	89	=	B
70	–	79	=	C
0	–	69	=	F

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:
Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Formative: Case studies – (4) (equally weighted)	6.5%
Summative: Tests – (4-6) (equally weighted)	45.5 %
Formative: Homework Assignments & lecture quizzes – (equally weighted)	13%
Formative: Lab exercises/questions & lab quizzes – (equally weighted)	17.5%
Summative: Practical – (5-10) (equally weighted)	17.5%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Collect, process, and analyze biological specimens and other related substances.
2. Recognize factors that affect procedures and results, and take appropriate actions within predetermined limits when corrections are indicated.
3. Perform and monitor quality control within predetermined limits.
4. Apply basic scientific principles for application in medical laboratory procedures and methodologies.
5. Employ safety principles according to health and environmental regulations.
6. Correlate laboratory results with common disease processes and treatments for diagnosis.
7. Demonstrate professional conduct and interpersonal communication skills with patients, laboratory personnel, other healthcare personnel, and the public.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.