MLT 120L - Clinical Chemistry I Lab

Approval Date:  Effective Term:

Department: MEDICAL LABORATORY TECHNICIAN
Division: Allied Health/Public Safety
Units: 1.00
Grading Option: Letter Grade
Transferability: CSU Transferable
Course is: AA/AS Degree
Repeatability:  
Contact Hours per Term:  
Lab: 4.00
Associate Degree GE Applicability: No
Recommended Class Size: 15
-Rationale: Station limitations.

Discipline/Minimum Qualifications:

Catalog Description:  
Introduces the various types of instrumentation used in the clinical chemistry laboratory, including testing parameters, calibration, quality control, preventative maintenance, and some manual procedures.

Schedule Description:  
Introduces the various types of instrumentation used in the clinical chemistry laboratory, including testing parameters, calibration, quality control, preventative maintenance, and some manual procedures.

Student Learning Outcome:
1. Compare and contrast different types of chemistry laboratory instrumentation, including methodology, sampling, and maintenance.
2. Perform basic testing procedures used in the clinical chemistry laboratory.

Course Objectives:
1. Practice the use of Standard Precautions as they apply in the clinical Chemistry laboratory according to Occupational Safety and Health Administration (OSHA) mandates.
2. Demonstrate safe use and disposal of biohazardous materials.
3. Compare and contrast different types of Chemistry laboratory instrumentation.
4. Evaluate the difference in specimen types and how they affect Chemistry analysis as part of the preanalytical phase.
5. Demonstrate the use of basic laboratory mathematics necessary to perform tests, make dilutions, and prepare solutions.
7. Define quality assurance and quality control, their interrelationships and differences.

http://www.curricunet.com/Canyons/reports/course_outline_html.cfm?courses_id=1743
8. Define the responsibilities of the tech assigned to a Point of Care Testing (POCT) program.
9. Describe how a laboratory arrives at normal ranges and control ranges initially and when instrumentation differs.
10. Discuss the biochemical and physiologic changes of aging and how these changes affect clinical chemistry testing.
11. Discuss the adaptive changes that occur upon birth of an infant and how these changes affect clinical Chemistry testing.
12. Demonstrate the ability to use basic supplies and equipment correctly.

Course Content Outline:

A. Standard Precautions as they apply in the Chemistry laboratory according to Occupational Safety and Health Administration (OSHA) mandates.
   1. Basic aspects of infection control policies, including how and when to use personal protective equipment (PPE) or devices (gown, gloves, and goggles).
   2. Use of PPE in the Chemistry laboratory.
   4. Pre and post exposure prophylactic measures for handling potentially occupational transmission of certain pathogens.
   5. Disinfectants used to decontaminate the work area when a hazardous spill has occurred or when beginning or ending a laboratory session.
   6. Basic steps in first aid.
   7. Issues in a Safety Program:
      a. Evacuation routes,
      b. Biohazardous material,
      c. Blood borne pathogens (BBP),
      d. Standard precautions,
      e. Aerosols,
      f. Material Safety Data Sheets (MSDS).
B. Safe use and disposal of biohazardous materials.
   1. Segregation and disposal of various types of waste products generated in the clinical laboratory including the use of sharps containers for needles, lancets, and/or other sharps.
   2. Disposal of biological samples.
C. Different types of Chemistry laboratory instrumentation.
   1. The mechanism of measurement of each type of instrumentation.
   2. Advantages and disadvantages of each type of instrumentation.
   3. The difference between batch analyzers and sequential analyzers.
   4. Five common principles of automated systems.
   5. Appropriate maintenance on instruments.
   6. Calibration and quality control on instruments.
   7. Actions and reasons for quality control results outside ranges of 2SD.
D. The differences in specimen types and how they affect chemistry analysis as part of the pre-analytical phase.
   1. Patient variables
   2. Collection sites
   3. Patient identification & specimen labeling.
   4. Sample transportation, processing, and storage.
5. Centrifugation (horizontal vs. fixed angle) and time requirements.
6. Hemolysis, lipemia, icterus.
7. Plasma vs. serum.
8. Whole blood vs. fingerstick.
9. Venous, arterial, capillary specimens.
10. Anticoagulant and serum separator tubes.
11. Laboratory criteria for rejection of specimens.

E. Basic laboratory mathematics to perform tests, make dilutions, and prepare solutions.
1. Identification, selection and use of laboratory glassware.
2. Conversions within the metric system and simple dilutions.
3. Grades of water and reagents used in the clinical laboratory.
4. Preparation of solutions of various concentrations and dilutions.
5. Dilutions in a volumetric flask including correct pipetting technique.
7. Pipetting techniques and dilution techniques with automatic pipettes.
8. Serial dilutions
1. Beer’s law and its use to calculate analyte concentration.
2. The relationship between absorbance, transmittance, and concentration.

G. Quality control and quality assurance, their interrelationships and differences.
1. Standards and control, their use and their differences.
2. Primary, secondary, and reference standards used in chemistry.
3. Criteria used for the selection of control material.
4. Levey-Jennings graphs for control ranges.
5. Westgard rules for corrective action.
6. Internal quality control ranges.
   a. Raw data used to calculate a new control range for each control used.
   b. Comparing newly calculated ranges to the insert and their differences and why they exist.
   c. Levey-Jennings charts and the difference in out-of-control situations.
H. The responsibilities of the tech assigned to a POCT program.
   1. The principles, procedures, expected results, quality control, sensitivity and specificity of each
      chemistry method assigned.
   2. Relationships between finger stick glucose, serum glucose, and whole blood glucose levels.
   3. Linear checks on one-touch glucose meters or other simple bench instruments.
I. Establishing normal ranges and control ranges when instrumentation differs.
   1. Reasons for quality control differences a tech will see from one instrument to another and how it is
      managed.
   2. Comparison of control ranges from different methods and the relationship of the differences to the
      method.
   3. Calculation of simple method comparison.
J. Biochemical and physiologic changes of aging and how these changes affect clinical chemistry testing.
   1. Age-related changes in clinical chemistry analytes.
   2. Establishing reference intervals for the elderly and the problems associated with establishing these
      intervals.
   3. The effects of medications on clinical chemistry results in the elderly.
   4. The effects of exercise and nutrition on clinical chemistry results in the elderly.
   5. Age-related physiological changes and laboratory results with pathological conditions.
K. Adaptive changes upon birth of an infant, and how these changes affect clinical chemistry testing.
2. Changes that occur in children with regard to electrolyte and water balance, energy metabolism, hormone balance, and humoral and cellular immunity.
3. Differences in drug treatment and pharmacokinetics in children and adults.
5. Procedures used to identify inherited metabolic disorders in children.

Methods of Instruction:
Lab:

Methods of Evaluation:
Exams/Tests/Quizzes
Problem Solving
Skill Demonstrations

Lab activity: Practice and demonstration of techniques in the student laboratory designed to demonstrate critical thinking skills and to problem solve as required in the assignments and experimental investigations. Written assignments: Laboratory worksheets to evaluate the student's performance and understanding of the course material. Comprehensive written final exam: Written test and hands on demonstration of proper laboratory techniques requiring the student to demonstrate their ability to summarize, integrate, and critically analyze concepts examined throughout the course. Problem solving: Case studies and analyzing unknown samples will evaluate the student's ability to apply critical thinking skills to a clinical situation. Skills demonstration: Laboratory practical exam demonstrating the student's ability to integrate the knowledge acquired in the course with the technical skills necessary for the MLT profession.

Typical Assignments:
Reading:
Written exams Practical exams Skills demonstrations Laboratory write-ups
Writing, Problem Solving or Performance:
Problem solving for case studies Short essay answers for some exam questions Some calculations
Other:

Required Materials
Examples:
Book 1
Author: Bishop, Michael L., Edward P. Fody, & Larry E. Schoeff
Publication Date: 2004 Edition: 5th
Title: Clinical Chemistry: Principals, Procedures, Publisher: Lippincott, Williams & Wilkins
Correlations

**Book 2**

**Author:** Burtis, Carl A. & Edward R. Ashwood  
**Publication Date:** 2007  
**Edition:** 5th  
**Title:** Tietz Fundamentals of Clinical Chemistry  
**Publisher:** Saunders

**Book 3**

**Author:** McPherson, Richard A. and Matthew R. Pincus  
**Publication Date:** 2006  
**Edition:** 21st  
**Title:** Henry's Clinical Diagnosis and Management by Lab Methods  
**Publisher:** Saunders

**Course Preparation:**

- **Prerequisite(s):** None
- **Co-Requisite(s):** MLT 120
- **Recommended:** None