Acronym/Number  MLT 242  Historical Ref.  MLTS 422

Title  Clinical Chemistry

Credit Breakout  8  6  4  0  0  (credit  lecture  lab  practicum  work experience)

PREREQUISITE(S): Grade of “C” or better in MLT 115 and MLT 120. Successful completion of the following courses: BIO 164 or equivalent; CHM 122 or equivalent; CHM 132 or equivalent.

COURSE DESCRIPTION:
Study and analysis of electrolytes, protein, lipids, enzymes, hormones, drugs, and various other biochemical compounds found in the human body. Test results are correlated to patient's conditions. Laboratory math, statistics, and quality control are presented.

COURSE COMPETENCIES:
During this course, the student will be expected to:

1. Explain appropriate safety procedures for the clinical chemistry laboratory.
2. Demonstrate appropriate safety procedures for the clinical chemistry laboratory.
3. Comply with laboratory safety rules.
   3.1 Locate safety equipment in the laboratory.
   3.2 Observe safety procedures for the laboratory.
   3.3 Use lab safety equipment properly.
4. Maintain team atmosphere in laboratory functions.
   4.1 Follow safety rules during laboratory exercises.
   4.2 Prepare reagents and controls.
   4.3 Assist and share information with other students.
   4.4 Clean up after self.
5. Identify proper specimen collection and transport.
   5.1 List types of transport tubes and preservatives.
   5.2 List special transport conditions.
   5.3 State rationale for each type.
   5.4 Identify criteria for specimen collection.
6. Use laboratory equipment typical of the clinical chemistry Area.
   6.1 Demonstrate correct use of pipetting devices.
   6.2 Demonstrate good dexterity in use of clinical laboratory equipment.
7. Demonstrate knowledge of basic laboratory procedures.
   7.1 Define principles of basic laboratory procedures.
MLT 242

7.2 Define basic procedures related to testing.
7.3 Identify fundamental biological characteristics pertaining to laboratory testing.
7.4 Identify sources of error in laboratory testing.
7.5 Define fundamental characteristics of laboratory operations.

8. Demonstrate knowledge of technical skills.
8.1 Utilize proper laboratory methods.
8.2 Select procedural course of action.
8.3 Prepare reagents for tests.
8.4 Calibrate instruments to perform tests.
8.5 Prepare controls for tests.

9. Demonstrate knowledge of laboratory math.
9.1 Convert units for laboratory values.
9.2 Prepare solutions of a given molarity.
9.3 Perform calculations using molarity, normality, percent weight/volume, and percent volume/volume.
9.4 Calculate the dilution facto(s) for simple and serial dilution schemes.
9.5 Perform serial and doubling dilutions.
9.6 Calculate concentration using Beer’s Law.
9.7 Calculate the mean, standard deviation and coefficient of variation.
9.8 Evaluate the statistical significance of accuracy and precision.
9.9 Prepare Levey-Jennings and quality control charts.
9.10 Plot quality control values on Levey-Jennings and quality control charts.

10. Apply mathematical skills typical for clinical laboratory work.
10.1 Calculate results from supplied data.
10.2 Calculate results from obtained data.

11. Discuss Quality Assurance in daily laboratory functions.
11.1 Associate laboratory findings and clinical data to assess test results and procedures.
11.2 Associate laboratory findings and quality control data to assess test results and procedures.
11.3 Associate laboratory and other laboratory data to assess test results and procedures.

12. Demonstrate judgment and decision making skills.
12.1 Analyze laboratory findings to recognize common procedural and technical problems.
12.2 Evaluate laboratory findings to take corrective action according to predetermined criteria.
12.3 Analyze laboratory findings to check for common error.
12.4 Evaluate laboratory findings to recognize and report the need for additional testing.

13.1 Identify the anatomy of the kidney.
13.2 List the main renal functions.
13.3 Outline the formation of urine including protein conservation metabolic production and renal control of urea nitrogen, serum creatinine, and uric acid.
13.4 State expected abnormal results given pathological conditions associated with the kidney.
13.5 Perform renal function tests and state the chemical reaction.

14. Discuss automated laboratory equipment used in clinical chemistry.
14.1 Describe the function of the main components of the specific analyzers used in clinical chemical analysis.
14.2 Describe and perform quality control and maintenance on the analyzers.

15. Explain Electrolytes and blood gases.
15.1 Discuss the influences of water and mineral metabolism on the pH and electrolyte balance in the body.
15.2 Discuss the principle of tests used to measure blood gases and electrolytes.
15.3 Describe the patient conditions and compensatory mechanisms in the metabolic and respiratory imbalances in alkalosis and acidosis.
15.4 List normal values of pH, PCO₂, pO₂, and Bicarbonate, and recognize sources of error.
15.5 Describe principles and perform osmometry.

16.1 Define protein metabolism.
16.2 List normal values and sources of error in protein measurements.
16.3 Describe the principle of electrophoresis.
16.4 Identify the bands of protein separated in protein electrophoresis.

17. Explain the nature of Enzymes.
17.1 Describe method of nomenclature for enzymes.
17.2 Define coenzyme and isoenzyme.
17.3 List functions and enzymes.
17.4 Explain Kinetics of enzymes.
17.5 State the principle, normal values, clinical significance when values are elevated or depressed in the major organ enzymes.
17.6 List sources of error in testing.

18. Describe the anatomy and functions of the liver.
18.1 Describe jaundice and causes of this condition.
18.2 Explain the principle of bilirubin tests.
18.3 Recognize source of error.
18.4 Correlate related urinalysis results with liver function test results.

19. Demonstrate an understanding the role of hormones in the body.
19.1 List sources, functions and targets of assigned hormones.
19.2 Explain negative feedback.
19.3 State the principle of tests used to measure hormone levels in the body.

20. Discuss Lipids.
20.1 Explain briefly the metabolism of lipids including absorption, esterification, transport and storage.
20.3 Explain principle of cholesterol procedures including sources of error and normal
values.

20.4 List the types of hyperlipoproteinemia.
20.5 Describe the significance of HDL and LDL cholesterol, triglycerides and chylomicrons.

21. Discuss chemical analysis of cerebrospinal fluid and other body fluids and secretions.
21.1 Describe the formation and function of Cerebrospinal fluid and other body fluids and secretions.
21.2 Discuss the diagnostic use for gastric analysis.
21.3 Differentiate between transudates and exudates and list two tests performed on the each.
21.4 Discuss amniotic fluid function and testing.

22. Describe clinical toxicology.
22.1 List the functions of a toxicology lab.
22.2 Explain pharmacokinetics.
22.3 Explain the reason for therapeutic drug monitoring (TDM).
22.4 Describe the principles of immunologic, chromatography and spectrophotometric techniques.

23. Demonstrate an understanding of immunochemical techniques.
23.1 Describe immunodiffusion.
23.2 Describe immunoelectrophoresis.
23.3 Describe basic immunoassay.
23.4 Describe competitive binding

24. Discuss disorders of carbohydrate metabolism.
24.1 Explain normal carbohydrate metabolism.
24.2 List diseases associated with hyperglycemia and hypoglycemia.
24.3 Perform chemical and enzymatic glucose procedures.
24.4 Correlate the presence of glucose in urine and other body fluids.
24.6 Discuss and perform analysis of glycosylated hemoglobin.

25. Discuss mineral metabolism as it relates to health and disease states.
25.1 Describe calcium regulation.
25.2 Describe functions of phosphate, magnesium and lithium and other trace elements in the body.
25.3 Review the role of iron in formation of hemoglobin.
25.4 Discuss iron deficiency disorders.
25.5 Demonstrate an understanding of test procedures relating to iron.

COMPETENCIES REVIEWED AND APPROVED BY: Karen Campbell

DATE: October 2007

FACULTY:
1. Karen Campbell
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MLT 242

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Effective date  August 2008

Originated by:  Jeannette M. Daehler

Campus:  A  B  C  U  N  W  OC

extension:  6296

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