SYLLABUS
PART I
EDISON COMMUNITY COLLEGE
MLT 230S CLINICAL CHEMISTRY
4 CREDIT HOURS

COURSE DESCRIPTION

Study of carbohydrates, lipids, proteins, enzymes, electrolytes, trace elements, acid/base balance, therapeutic drug monitoring, toxicology, bilirubin, endocrinology, and genetic disorders. Included are the definition of analytes, disease states, and methods of analysis. The methodology and operation of key Clinical Chemistry procedures and instruments including automated analyzers, spectrophotometers, blood gas analyzers, electrophoresis, chromatography, Ph meters and others are discussed. Also studied is the statistical analysis necessary for laboratory quality control, quality assurance and calibration including standard deviation, mean, mode, and median, coefficient of variation, confidence limits, and reference intervals. Prerequisite: MLT 121S with a grade of "B" or better and acceptance into the MLT program. Lab fee.

COURSE GOALS

The student will:

| Bloom's level | | Program Outcomes |
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| 5 | 1. Define, calculate, utilize, evaluate, and interpret statistical data for quality control and statistical analyses including mean, mode, median, standard deviation, coefficient of variation, reference intervals, confidence limits, Gaussian distribution, Levey-Jennings charts, scales, graphs, charts and Westgard multi-rule system. Given samples of periodic quality control data and charts, identify shifts and trends; recommend corrective action to resolve quality issues and demonstrate appropriate documentation. | 2 |
| 2 | 2. Identify and explain basic concepts, components, and operations of fluorometry, densitometry, spectrophotometry, blood gas analyzers, electrophoresis, chromatography, coulometry, osmometry, automated chemistry analyzers, nephelometry and pH meters. | 1 |
| 1 | 3. Identify basic separation mechanisms and techniques of chromatography including partition, adsorption, column, paper, thin layer, liquid (HPLC) and gas (GLC). | 1 |
| 2 | 4. Define carbohydrate, monosaccharide, disaccharide, and polysaccharide and discuss carbohydrate metabolism stating the main physiological functions of carbohydrates. | 4 |
| 1 | 5. Define the metabolic processes of glycolysis, glycogenesis, glycogenolysis, and gluconeogenesis. | 4 |
| 2 | 6. Explain the effect of insulin in regulating glucose levels. | 4 |
| 2 | 7. Explain etiology, symptoms and effects of Type 1, Type 2, and Gestational Diabetes Mellitus. | 4 |
| 2 | 8. Discuss methodologies for carbohydrate determinations and explain the clinical significance of ketone measurement. | 3,4 |
| 2 | 9. Explain usefulness of patient preparation and procedure for GTT; include normal and diagnostic levels. | 2,3 |

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| 2 | 10. Define lipid, lipoprotein, and lipemia and discuss the methodologies for lipid determinations. | 4 |
| 1 | 11. Define isoelectric point, Zwitterions, amino acid, peptide bond, and complex or conjugated protein. | 4 |
| 1 | 12. Identify the main site of synthesis for plasma proteins. | 4 |
| 1 | 13. Define enzyme, catalyst, and cofactor. | 4 |
| 2 | 14. Discuss disease states and primary tissue source(s) for clinically significant enzymes including LD, CK, CK-MB, CK isoenzymes, AST, ALT, GGT, ALP, ACP, Amylase, Lipase and Cholinesterase/pseudo cholinesterase. | 2,4 |
| 2 | 15. Discuss enzyme levels with associated diseases/conditions including myocardial infarction, liver disease, muscle disease, bone disease, malignancy, hematological disorders, pancreatitis, and others. | 2,4 |
| 2 | 16. Explain the synthesis and mode of excretion for urea and creatinine. | 4 |
| 1 | 17. State disease states and disorders associated with BUN, creatinine, and uric acid measurements. | 4 |
| 1 | 18. Define acid, acidosis, acidemia, base, alkalosis, alkalemia, base excess, buffer, pH, partial pressure, oxygen saturation, P50, oxygen capacity, hypoxia, hypoxemia, Henderson-Hasselbach equation. | 4 |
| 2 | 19. Explain blood gas specimen collection handling requirements. | 3 |
| 1 | 20. Define TDM, toxicology, steady state, half life, therapeutic range, peak and trough, drugs of abuse, emergency toxicology, and chronic poisoning. | 4 |
| 3 | 21. Explain and demonstrate proper specimen collection including time of draw relative to last dose, requirements for legal and forensic samples. | 3 |
| 1 | 22. Identify basic concepts relating to the significance of bilirubin. | 4 |
| 2 | 23. Explain biosynthesis including heme catabolism and bilirubin conjugation. | 4 |
| 4 | 24. Identify, compare and contrast disease states including prehepatic jaundice, neonatal jaundice, intrinsic and extrinsic hemolytic anemia, hepatic and posthepatic jaundice. | 4 |
| 4 | 25. Identify, compare and contrast methods of analysis for total/direct bilirubin including Evelyn-Malloy, Jendrassik-Grof, and Direct. | 1,4 |
| 1 | 26. Define hormone, endocrine, releasing factor/hormone, tropic hormone, effector hormone, glucocorticoid, mineralocorticoid, and diurnal variation. | 4 |
| 1 | 27. Define genetic disease. | 4 |
| 4 | 28. Categorize and list examples of genetic diseases including chromosomal aberration, inborn errors of metabolism, and polygenic disorders. | 4 |
| 1 | 29. Describe the etiology, incidence, clinical symptoms, pathophysiology and laboratory findings for inborn errors of metabolism including cystinuria, PKU, tyrosinosis, alkaptonuria, maple syrup disease (MSUD), and albinism. | 4 |
| 1 | 30. Describe laboratory screening procedures for the diagnosis of each metabolic disorder including urine color, urine odor, urine crystals, and colorimetric tests on urine | 1 |
| 5 | 31. Analyze and interpret results of controls and reference materials/standards, assayed and unassayed, primary and secondary. | 2 |
| 5 | 32. Identify laboratory errors and biases including preanalytical, analytical (random/systematic), and postanalytical; and develop procedures to locate, monitor and prevent errors. | 2 |
| 5 | 33. Understand and apply all aspects of quality assurance programs including justification, establishment, types of programs (internal and external), interpretation of statistical data, and recognition of shifts and trends. | 4 |

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| 3 | 34. Demonstrate effective use of the spectrophotometer by performing a standard curve and analyte concentration analysis. | 1 |
| 1 | 35. List and describe hazardous exposure risks in chemistry laboratory; display safe and accountable behavior. | 5 |
| 3 | 36. Demonstrate professionalism in the health care field regarding ethics, dress codes, and HIPAA. | 6,8 |
| 3 | 37. Demonstrate effective interpersonal skills and teamwork in all interactions including colleagues and instructors. | 7,8 |
| 2 | 38. Summarize interfering substances and their effects on common chemistry analyte measurement. | 2 |

CORE VALUES

The Core Values are a set of principles which guide in creating educational programs and environments at Edison. They include communication, ethics, critical thinking, human diversity, inquiry/respect for learning, and interpersonal skills/teamwork. The goals, objectives, and activities in this course will introduce/reinforce these Core Values whenever appropriate.

TOPIC OUTLINE

1. Quality Control, Quality Assurance, and Statistical Analysis
2. Key Chemistry Analyzers
3. Electrophoresis and Chromatography
4. Automated Chemistry Analyzers
5. Carbohydrates
6. Lipids
7. Proteins
8. Cardiac function and laboratory diagnosis
9. Renal function and laboratory diagnosis
10. Liver function and laboratory diagnosis
11. TDM and Toxicology
12. Genetic Disorders