BIMS 4326: CLINICAL CHEMISTRY II
SPRING 2013 SYLLABUS

COURSE DESCRIPTION

This course studies the theory and practice of analytical procedures in clinical chemistry and comparative methodology of diagnostic tests with normal and abnormal human physiology as applied to diagnosis of pathological conditions. Emphasis is on advanced procedures and clinical correlations.

LEARNING OBJECTIVES

The student will be able to:

1. Develop understanding of the body’s major organ systems and the role that each plays in the normal functioning of the body.
2. Acquire knowledge of the principles of laboratory methods, their uses, specimen requirements, and sources of error.
3. Identify selected pathological conditions and the analytes that would be altered in the event of such conditions.
4. Evaluate laboratory test results and correlate them with other laboratory and clinical findings.

Specific course objectives are attached. All examination questions are keyed to the objectives.

TEXT and MATERIALS


You will need a scientific calculator.
DROPPING A CLASS

I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. April 01, 2011 is the last day to drop a class with an automatic grade of “W” this term.

CLASSROOM/PROFESSIONAL BEHAVIOR

Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom.

GRADES

Course grades will be determined based on four exams, attendance, problem portfolios and a final exam according to the following percentages:

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>PERCENT OF GRADE</th>
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<tbody>
<tr>
<td>Exam I</td>
<td>15%</td>
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<td>Exam 2</td>
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<td>Exam 3</td>
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<td>Exam 4</td>
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<tr>
<td>PROBLEM PORTFOLIO</td>
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<tr>
<td>FINAL</td>
<td>25%</td>
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It is assumed that you have mastered the material covered in Clinical Chemistry I, therefore, questions from the previous semester may be included in each exam. Attendance will be taken in class.

There is no provision for making up late work and missed exams. Unexcused absence during major exams will also result in a zero for that exam. It is the student’s responsibility to contact me in cases of extreme emergency. The only excused absences are personal illness, immediate family medical emergency, or attending funeral of immediate family.

The following scale will be used to report grades:

<table>
<thead>
<tr>
<th>GRADE</th>
<th>RANGE</th>
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<tbody>
<tr>
<td>A</td>
<td>90 - 100</td>
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<td>B</td>
<td>80 - 89</td>
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<tr>
<td>C</td>
<td>70 - 79</td>
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<td>D</td>
<td>60 - 69</td>
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<tr>
<td>F</td>
<td>below 60</td>
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GRADE APPEALS

As stated in the Texas A&M University-Corpus Christi University Rules and Procedures (Section B [Academic Program], Pat 13 [Students]: 13.02.99.C2 [Student Grade Appeals] and 13.02.99C2.01 [Student Grade Appeal Procedures]), a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is on the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, consult the University Rules and Procedures specified above (accessible through the University Rules and Procedures website at http://www.tamucc.edu/provost/university_rules/index.html). For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

ACADEMIC HONESTY

The University catalog contains the university statement on academic integrity. It is essential that anyone considering a health career demonstrate honesty and integrity in their academic and professional life. Therefore, cheating will not be tolerated and will result in a failing grade in the course and possible further disciplinary action by the university.

ATTENDANCE

Attendance is required, and if you miss a class, you are expected to know the material covered in class. If you miss a scheduled laboratory, and samples or reagents are not available, a zero will be given for that portion of the grade in the assignment. Other parts of that assignment must be turned in on time for a partial grade. Examinations may only be taken during the scheduled time.

AMERICANS WITH DISABILITIES ACT (ADA)

Texas A&M University-Corpus Christi is committed to providing persons with disabilities an equal opportunity to access campus facilities, resources and programs. The ADA is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation for their disabilities. Support and accommodations are also available for returning veterans who experience cognitive and/or physical access issues in the classroom or on campus. Our Office of Disability Services arranges such support and academic accommodations. To make a request, or for more information, call (361) 825-5816 or visit the office in Driftwood 101. It is important to contact the Office of Disability Services in a timely fashion as it will take time for them to review requests and prepare accommodations and accommodation letters.
January
24  Preanalytical Variation
29  Reference Intervals (chapter 4)
31  Quality Control in Clinical Chemistry Laboratory (chapter 4)

February
05  Body Fluids (chapter 28)
07  Cardiac Function (chapter 25)
12  EXAM 1
14  Isoenzymes (chapter 12)
19  Lipid Disorders (chapter 14)
21  Lipid Disorders (chapter 14)
26  Pancreatic Function (chapter 27)
28  GI Function & Disorders (chapter 27)

March
05  Porphyrin Metabolism & Disorders (chapter 18)
07  Iron status (chapter 17)
11-15  Spring Break
19  EXAM 2
21  Endocrinology (Hormones) (chapter 19)
26  Steroid Hormones (chapter 20)
28  Adrenal Function (chapter 20)

April
02  Adrenal Function (chapter 20)
04  Reproductive Hormones (chapter 21)
09  Thyroid Function (chapter 22)
11  Thyroid Function (chapter 22)
EXAM 3
TDM (Therapeutic Drug Monitoring) (chapter 29)
Toxicology (chapter 30)
Chemistry of Pregnancy
Tumor Markers (chapter 31)

EXAM 4
Nutritional Assessment (chapter 32)

FINAL: 11:00-1:30 p.m.

General Disclaimer:
The instructor reserves the right to modify the schedule when necessary. These changes
will be announced in class. It is the responsibility of students to obtain the information
as no effort will be made to contact students who were absent when the announcement
was made.
LEARNING OUTCOMES FOR BIMS 4326: CLINICAL CHEMISTRY 11

Preanalytical Variation
At the conclusion of the lecture, the student should be able to:
1. Describe the three major categories of preanalytical variation.
2. Discuss the appropriate uses of anticoagulants and their preservatives and their effects on common laboratory tests.
3. Define delta checks and summarize their utility in detection of preanalytical errors.

Reference Intervals
At the conclusion of the lecture, the student should be able to:
1. State the purpose of reference intervals.
2. Describe how reference intervals are obtained.
3. Define clinical decision limits, specificity, sensitivity, and predictive value.

Quality Control in Clinical Chemistry Laboratory
At the conclusion of the lecture, the student should be able to:
1. Describe a good quality control program.
2. Understand routine quality control rules.
3. Evaluate out of control problems and actions to resolve the problem.
4. Define calibrators
5. Understand external Quality Control programs and their importance in the lab.

Body Fluids
At the conclusion of the lecture, the student should be able to:
1. Define serous fluid, synovial fluid, and CSF.
2. Differentiate between transudate and exudates.
3. Describe routine tests and normal results for synovial, serous, and CSF.
4. Describe changes in synovial, serous, and CSF in pathological conditions.

Cardiac Function
At the conclusion of the lecture, the student should be able to:
1. Discuss the etiology of the following heart conditions: congenital, hypertensive, infectious, coronary, or congestive heart disease.
2. List the factors for an ideal cardiac marker.
3. Discuss the enzymes useful in the diagnosis of cardiac disorders.
4. Discuss the time course of enzyme activity in AMI.
5. Assess the clinical utility of the various cardiac markers for AMI.

Isoenzymes
At the conclusion of the lecture, the student should be able to:
1. Define ‘isoenzyme’ and characterize the isoenzyme of CK, LD, ALP.
2. Describe methods of assay for CD isoenzyme, LD isoenzyme, and the isoenzyme of ALP.
3. Discuss interpretations of isoenzyme patterns in MI.
4. Discuss interpretations of isoenzyme patterns in diseases of liver and bone.
5. Discuss isoenzymes as tumor markers.

**Lipid Disorders**
At the conclusion of the lecture, the student should be able to:
1. Discuss the nature, clinical application, and assay methods of HDL cholesterol and apoproteins
2. Explain the lipoprotein physiology and metabolism
3. Describe the methodology for lipoprotein phenotyping and characterize each lipoprotein factor
4. Describe each of the hypolipoproteinemias and lab results in each
5. Classify each of the hyperlipoproteinemias by triglyceride and cholesterol values, serum appearance, and electrophoresis patterns.

**Pancreatic Function**
At the conclusion of the lecture, the student should be able to:
1. Describe the function of the pancreas including hormones and enzymes produced and stimulation of pancreatic secretion
2. Describe cystic fibrosis and diagnostic tests for CF
4. Describe laboratory diagnosis of acute pancreatitis.

**GI Function and Disorders**
At the conclusion of the lecture, the student should be able to:
1. Discuss the phases of digestion and actions of the hormones and enzymes involved
2. State the purpose of tests of gastric acidity and how gastric acid is the most suitably measured
3. Describe the protocol for gastric analysis and calculation of BAO and MAO
4. Describe gastric results in pernicious anemia, gastric vs peptic ulcer, Zollinger-Ellison syndrome.
5. Evaluate the assays for serum gastrin and its significance.
6. Define steatorrhea and celiac disease and evaluate the performance and significance of the test for fecal fat.
7. Describe the significance of the D-xylose test, Schilling test, and lactose tolerance test.

**Porphyrin Metabolism and Disorders**
At the conclusion of the lecture, the student should be able to:
1. Discuss the significance of heme.
2. Name the two classes of primary porphyria and explain the difference.
3. Describe the most distinctive lab findings in acute intermittent porphyria.
4. List the most common causes of secondary porphyrinuria and/or porphyrinemia.
5. Describe the following: Ehrlich’s aldehyde reaction, Watson-Schwartz test, porphyrin assay, assay of ALA and ALA dehydrase.
6. List the tests used in the detection and evaluation of lead overload and discuss relative usefulness.
Iron Status
At the conclusion of the lecture, the student should be able to:
1. Outline the metabolism of iron.
2. Outline the basic steps in the assays of serum iron, TIBC, UIBC, and explain what is being measured in each assay.
3. Recognize conditions associated with abnormalities of serum iron and TIBC.
4. Describe proper collection and handling of specimens for iron and TIBC and give the normal ranges for each.
5. Discuss the serum ferritin assay, the principle and clinical applications.

Endocrinology (Hormones)
At the conclusion of the lecture, the student should be able to:
1. Define ‘hormone’ and name and describe the three chemical types of hormones.
2. Describe the mechanism of action of each of the three chemical types of hormones.
3. List the components of the endocrine system and hormones produced by each and control mechanisms.
4. Discuss general methodology for a hormone assay.
5. Describe the clinical features of the excess and deficiency states for growth hormone, prolactin, and vasopressin.
6. Define the functions of the anterior and posterior pituitary hormones.
7. Discuss the regulation of prolactin secretion.

Steroid Hormones
At the conclusion of the lecture, the student should be able to:
1. Describe the general structure of steroid hormones.
2. Identify estrogens, androgens, progesterone, and adrenal cortical steroids by their structure.
3. Distinguish a glucocorticoid from a mineralocorticoid by structure.
4. Describe the Zimmerman reaction, the Porter-Silber reaction and the 17-Ketogenic steroid assay and identify compounds which would react in each assay.

Adrenal Function
At the conclusion of the lecture, the student should be able to:
1. Explain how the adrenal gland functions to maintain blood pressure, potassium, and glucose homeostasis.
2. Discuss the pathophysiology of adrenal cortex disorders, namely Cushing’s syndrome and Addison’s disease.
3. List the appropriate laboratory tests to differentiate between primary and secondary Cushing’s syndrome and Addison’s disease.
4. State the most useful measurements in supporting the diagnosis of pheochromocytoma.
Reproductive Hormones
At the conclusion of the lecture, the student should be able to:
1. Name the male and female sex hormones and biosynthetic pathways and the regulation of the hormones
2. List the metabolites of the steroid hormones.
3. Describe the appropriate lab testing protocol to effectively evaluate or monitor patients with suspected gonadal disease.
4. Correlate laboratory information with regard to suspected gonadal disorders, given a patient’s clinical data.

Thyroid Function
At the conclusion of the lecture, the student should be able to:
1. Discuss the biosynthesis, secretion, transport, and action of the thyroid hormones.
2. Explain the principles of the thyroid function tests, T3, T4, TSH, T3 Uptake.
3. Correlate laboratory information with regard to suspected thyroid disorders, given a patient’s clinical data.

Therapeutic Drug Monitoring (TDM)
At the conclusion of the lecture, the student should be able to:
1. Discuss factors influencing serum drug levels.
2. Discuss pharmacokinetics: dose-response curve, drug half-life, steady state, dosing intervals, peak and trough drug levels.
3. Discuss the characteristics of a drug that make it TDM essential.
4. Describe the TDM of cardiac drugs, antiepileptic drugs, theophylline, aminoglycosides, and antidepressant drugs.

Toxicology
At the conclusion of the lecture, the student should be able to:
1. Define the term toxicology.
2. List the major toxicants.
3. Define the pathologic mechanisms of the major toxicants.
4. Discuss the laboratory methods used to evaluate toxicity.
5. Explain the difference between quantitative and qualitative tests in toxicology.

Chemistry of Pregnancy
At the conclusion of the lecture, the student should be able to:
1. Outline the formation of amniotic fluid throughout pregnancy and the reason for performing amniocentesis.
2. Describe serum and urine levels of HCG, HPL, and estriol throughout pregnancy.
3. Define toxemia.
4. Describe assay methods and applications for HCG, HPL, and estriol.
5. State the purpose of monitoring alpha-fetoprotein levels in amniotic fluid.
6. Describe specimen collection and handling for L/S ratio.
**Tumor Markers**
At the conclusion of the lecture, the student should be able to:
1. Describe the major properties, assays, and clinical usefulness of CEA, AFP, CA125, CA19-9, PSA, β-hCG, and PALP.
2. Explain the role of tumor markers in cancer management.
3. Identify the characteristics of properties of an ideal tumor marker.
4. Explain the use of enzymes and hormones as tumor markers.

**Nutritional Assessment**
At the conclusion of the lecture, the student should be able to:
1. List biochemical parameters used to monitor nutritional status.
2. Correlate alterations in vitamin status with circumstances of increased metabolic requirements, age-related physiologic changes, or pathologic conditions.
3. Delineate laboratory procedures used in the assessment of vitamin status.
4. Discuss the role of the laboratory in nutritional assessment and monitoring.
5. Describe some of the electrolyte and mineral abnormalities associated with TPN.