
De Anza College
Clinical Chemistry II Lecture
HTEC-085D-61 CRN: 01008

Instructor Jenny Chang, MLS (ASCP)

4.5 units

Course Format: Online, Combo Asynchronous + Synchronous

*This is an online class with **SOME** scheduled meetings that meets in person as noted in the class listing & course schedule. The rest of the class can be completed independently each week on the student's own time.*

Course Description: The lecture series teaches the relationships between various organ systems and the analytes assayed in the clinical laboratory. These include the endocrine system and analytes assayed in the clinical laboratory, including tumor markers, therapeutic drugs, and compounds studied in toxicology. The student will correlate liver, kidney, and pancreatic function with test results and compare with states of health and disease. The function and laboratory analysis of various body fluids including effusions, spinal fluid, and synovial fluid will be included. Successful completion of this course and HTEC 85B is required before enrolling in HTEC 285.

Co-requisite: HTEC 85B (Clinical Chemistry I laboratory)

Required Text:

1. Bishop, Michael, Edward P. Fody, Carleen Van Siclen, James March Mistler, and Michelle Moy, *Clinical Chemistry Principles, Techniques, and Correlations*, 9th edition. Burlington, MA: Jones & Barlett Learning, 2023.
2. Lorraine J. Doucette, *Mathematics for the Clinical Laboratory 4th Edition*. Sanders Elsevier Company, 2021

Instructor Information:

Jenny Chang, MLS (ASCP)

Class time:

Monday & Wednesday: 4:30 PM – 6:35 PM

Class location:

Online (Note: Exams will be held on campus De Anza Room S73)

Office hours:

Monday & Wednesday 4:15-4:30PM (10min before each lecture) & 15 min immediately following after completion of each lecture (eg. 6:35-6:50pm) (Alternate appointment times/days may be arranged with advance notice)

Phone/Voicemail:

408-864-8790 (MLT Program Director: Alex Febo)

Fax Telephone:

408-864-5444 (MLT Program Director: Alex Febo)

Office Location:

Online

E-mail address:

changjenny@fhda.edu

Additional Texts (limited textbooks available for check out, see instructor):

1. Shauna C. Anderson and Susan Cockayne, *Clinical Chemistry: Concepts and Applications, Revised Edition*. Long Grove, IL: Waveland Press, 2007.
2. Wendy Arneson and Jean Brickell. *Clinical Chemistry A Laboratory Perspective*. Philadelphia, PA: F.A.Davis Company, 2007
3. Medical Terminology Text: Brooks, Myrna La Fleur, *Exploring Medical Language*. Philadelphia, PA: F.A. Davis Company. (Any edition)

Additional References and online sources:

1. Donna Larson, *Clinical Chemistry Fundamental and Laboratory Techniques*. Saunders, 2015.
2. Robert H. Christenson, Linda C. Gregory, Lisa J. Johnson, Gershon Shugar. *Appleton and Lange's Outline Review, Clinical Chemistry*. McGraw Hill Companies, 2001
3. www.medtraining.org
4. www.labtestsonline.org
5. www.webmd.com
6. www.nlm.nih.gov/medlineplus/medlineplus.html
7. www.westgard.com

The powerpoints are based on the above mentioned required textbooks but information has also been gathered from additional resources and online links too numerous to mention. Care has been taken that the information contained are accurate but, as new information becomes available, changes in clinical and technical practices become necessary. The student is advised to carefully consult lab professionals when necessary.

Attendance:

- ❑ Attendance in this course is mandatory. The ability to make-up a missed class session is up to the discretion of the instructor and will be dealt with on an individual basis. The student must initiate make-up sessions.
- ❑ **An unexcused absence results in an automatic drop** from the course
- ❑ Excessive tardiness will have an adverse effect on grades

Immunizations: Hepatitis B – first 2 shots

Masking Policy: Please mask if you are feeling unwell, or have symptoms of coughing, sneezing, running nose, fever, etc. Otherwise, we will be following State/County/Federal guidelines.

Grades:

94 – 100%	A	Attendance & Participation (5%)	~ 100 points*
90 – 93.9%	A-	Homework (15%)	~ 150 points*
87 – 89.9%	B+	Quizzes (10%)	~ 100 points*
84 – 86.9%	B	Exam 1 (20%) ¹	~ 135 points*
80 – 83.9%	B-	Exam 2 (20%) ¹	~ 135 points*
75 – 79.9%	C	Final (30%) ¹	~ 280 points*
70 – 74.9%	D+		~ 900 points**
65 – 69.9%	D		
64% and below	F		

* Points total are subject to change

The final grade will be based on the “weighted total” of scores from each of the assignments and exams above.

What is a weighted total? For example, assignment is worth 30/35 points and you had scored 30 points. The assignment is worth 20% of the final grade (that is it's weight). To make the score in points worth 20% of the total grade, you would take the percentage assignment score ($30/35 = .857$) and multiple that by 20% ($20\% \times 0.857 \times 100 = 17.1\%$). So, of the 20% possible to earn on the

¹ All Exams (Exam 1, Exam 2, & Final Exams) will be conducted live, in-person, on campus in the designated De Anza Room S73 at the regularly scheduled class time.

assignment, you would earn 17.1% toward your final grade. (For every assignment you can figure your grade percentage the same way.)

Use this table to keep track of how you are doing in the class. Remember that this is an estimate. Bear in mind that there are many homework, lab assignments and quizzes, etc. so it is the cumulative score that will be your final grade.

Assignments	% of grade	Your score	Total pts possible	Your score as a percentage	The % you earned toward your final grade
	A	B	C	$D = B / C$	$E = D \times A \times 100$
<i>(Example)</i>	20%	30	35	.857	17.1%
Attendance	5%				
Homework	15%				
Quizzes	10%				
Midterm #1	20%				
Midterm #2	20%				
Final	30%				
TOTAL	100%				

Dates to note: (please note: it's your responsibility to confirm on the DeAnza portal)

May 31, 2024 – last day to drop with a “Withdraw”

June 24, 2024 – Final Exam

As a courtesy, please notify me of your drop.

You are responsible for dropping the course in accordance with the above schedule. After **May 31, 2024**, you will receive a grade for the course.

You may access your final grades through the DeAnza portal at <https://myportal.fhda.edu>

Student Accountability: “There is a zero tolerance policy for any cheating, plagiarism, or behavior that would lead a reasonable person to assume that these actions have taken place. Anyone observing such behavior should report it to a faculty member at once. Anyone found by a faculty member to have committed plagiarism or to have cheated (or given the appearance of having done either), will be dropped from the course and given an F by the faculty member.” ~ BHS Division Student Handbook, De Anza College, p.6

Updated 4/5/21: Students must not share instructor material or collaborate on assignments/exams without approval (see Academic Integrity form). Instructors may request students to have cameras on during lectures or exams. Students caught cheating will be given a zero on the assignment per instructor discretion and the incident may be reported to the Dean with administrative consequences such as disciplinary probation, disciplinary suspension, or expulsion. De Anza's Academic Integrity policies can be reviewed online @ https://www.deanza.edu/policies/academic_integrity.html. It is the student's responsibility to know what constitutes academic dishonesty. Students with questions regarding unclear specific academic dishonesty situations must refer to the instructor.”

https://www.deanza.edu/policies/academic_integrity.html

HTEC 85D CHEM 2 SPRING 2024 LECTURE & READING ASSIGNMENT

WEEK	DATE	SUBJECT	READING ASSIGNMENT
1	8-Apr	Introduction Lab Safety & LIS	Chapter 2
	10-Apr	Method Evaluation & Assessment <i>start</i> Proteins	Chapter 3 (pp 77-89); Mathbook: chp 15 Chapter 6 (pp 175-198)
2	15-Apr	<i>finish</i> Proteins	Chapter 6 (pp 175-198)
	17-Apr	<i>start</i> Liver <i>finish</i> Liver Hepatitis (<i>student presentations</i>)	Chapter 19
3	22-Apr	Renal Function	Chapter 21
	24-Apr	Nonprotein Nitrogen Compounds	Chapter 7
4	29-Apr	Lipids & Lipoproteins	Chapter 10
	1-May	Pancreatic & GI Function	Chapter 22
5	6-May	EXAM #1	<i>Covers weeks 1-4</i>
	8-May	Basic Endocrinology Hypothalamic & Pituitary Function	Chapter 13 Chapter 15
6 online recording	13-May	Thyroid	Chapter 14
	15-May	Adrenal Function	Chapter 16
7 online recording	20-May	Gonadal Function	Chapter 17
	22-May	Parathyroid Function & Ca Homeostasis	Chapter 18
8	27-May	NO CLASS	HOLIDAY: Memorial Day (Mon)
	28-May	<i>Pre-Exam Office Hour (Tues 4:15-6:15pm)</i>	
	29-May	EXAM #2	<i>Covers weeks 5-7</i>
9	3-Jun	Therapeutic Drug Monitoring	Chapter 25
	5-Jun	Toxicology	Chapter 26
10	10-Jun	Tumor Markers	Chapter 28
	12-Jun	<i>Body Fluids (student presentations)</i>	Chapter 23
11	17-Jun	Customer Service + Interview Tips	
	19-Jun	NO CLASS	HOLIDAY: Juneteenth (Mon)
12	24-Jun	FINAL	<i>Covers weeks 1-11</i>

All Exams (Exam 1, Exam 2, & Final Exam) will be conducted live, in-person, & on campus in the designated De Anza Room S73 at the regularly scheduled class time.

There are absolutely no late or make-up quizzes, exams, or assignments. The final exam date and time have been determined and mandated by the college. No early/late final exam may be scheduled. If you know that you are unable to take the final at the date and time above, please drop the class.

Disclaimer: Any of information in this syllabus is subject to change if the instructor finds it necessary. Changes will be announced during a class session and those who are absent will be held responsible for any announced changes to the syllabus.

Course Objectives:

A. Safety/Biohazardous Waste:

1. State the basics aspects of infection control policies, including how and when to use personal protective equipment (PPE) or devices (gowns, gloves and goggles).
2. Describe how to properly segregate and dispose of various types of waste products generated in the clinical laboratory including the use of sharps containers for needles, lancets and/or other sharps.

B. Amino Acids and Proteins: Discuss the biochemical and physiology of proteins including metabolic pathways.

1. List at least five general causes of abnormal serum protein concentrations.
2. Describe the principle of the methods used for both qualitative and quantitative determination and identification of urine proteins.
3. Differentiate the types of proteinuria on the basis of etiology and type of protein found in the urine.
4. Differentiate reference intervals for total protein and albumin from abnormal values and discuss any nonpathologic factors that influence the levels.
5. Correlate diseases associated with alternations in cerebrospinal fluid patterns.
6. Evaluate protein fraction patterns when given a densitometric scan of a serum protein electrophoresis using the routine method of five zones. Correctly diagnose each normal or abnormal protein.
7. Correlate patient results with associated disease states, disorders or pre-analytical issues.

C. Nonprotein Nitrogen Compounds: Examine the biochemical theory and physiology of non-protein-nitrogen substances (NPNS) commonly analyzed in the clinical laboratory, identify clinically significant results, relate laboratory results to metabolism, chemical and physical properties.

1. List the nonprotein nitrogen components of the blood.
2. Summarize specimen collection, transport and storage requirements necessary for the determination of nonprotein nitrogen compounds.
3. Perform calculations for creatinine clearance and estimated glomerular filtration rate.
4. Calculate 24-hour creatinine excretion.

D. Liver: Recognize the normal structure and function of the liver, the pathology associated with it and the laboratory tests used to aid in the diagnosis of liver disorders.

1. Summarize the function and structure of the liver to include anatomic and microscopic characteristics.
2. Differentiate between conjugated and unconjugated bilirubin in the blood.
3. Define jaundice and differentiate prehepatic, hepatic, and posthepatic jaundice.
4. Discuss liver disorders and appropriate laboratory tests needed for diagnosis.
5. Summarize specimen considerations, interference and reference ranges.
6. Identify the various types of hepatitis to include cause, transmission, occurrence, alternate name, physiology, diagnosis and treatment.
7. Apply knowledge of liver function to solve case studies presented.

E. Kidney: Illustrate renal anatomy and physiology and describe analytic procedures available to diagnose, monitor and treat kidney function.

1. Diagram the kidney and the major components of the nephron.
2. Describe the physiologic role of each part of the nephron.
3. Describe the mechanisms by which the kidney maintains fluid and electrolyte balance in conjunction with hormones.
4. Correlate laboratory test results with glomerulus and tubules disorders.
5. Apply knowledge of renal physiology and disease to solve case studies presented.

- F. **Lipids & Lipoproteins** Describe lipid chemistry, lipoprotein metabolism, diagnosis and treatment of dyslipidemia and laboratory tests used to measure lipids and lipoproteins.
1. Describe the structure of fatty acids, phospholipids, triglycerides and cholesterol.
 2. Describe the clinical tests used to assess lipids and lipoproteins, including principles and procedures.
 3. Interpret the clinical significance of lipid and lipoprotein values in the assessment of coronary heart disease.
 4. Correlate common lipid disorders with clinical and laboratory data.
- G. **Pancreatic & GI Function:** Discuss the physiology of pancreatic and GI function, diseases and laboratory testing associated with both.
1. Discuss the physiologic role of the pancreas in the digestive process.
 2. Relate the physiologic role of the pancreas to the digestive process.
 3. Identify the hormones and physiologic role of hormones released by the pancreas.
 4. Describe the physiology and biochemistry of gastric secretion.
 5. Identify laboratory tests used to assess pancreatic and intestinal function.
 6. Correlate laboratory data with possible pancreatic and GI tract conditions or diseases.
- H. **Basic Endocrinology: Hormones and Hypothalamic-Pituitary:** Summarize the multifunctional affect hormones have on physiologic functions and body organs.
1. Identify and differentiate the functions of hormones secreted by the hypothalamus and the anterior and posterior pituitary glands.
 2. Diagram the anatomic relationship between the pituitary and the hypothalamus.
 3. Explain the open-loop negative feedback and relate its function to hypothalamic-pituitary-endocrine target gland loops.
 4. Discuss the regulation of prolactin secretion.
 5. Correlate the clinical features, diagnostic testing and laboratory results for hormones discussed.
- I. **Gonadal Function:** Discuss the biosynthesis, secretion, transport, and action of the sex steroid and gonadotropins.
1. Differentiate the hypothalamic-pituitary -ovarian and hypothalamic-pituitary-testicular axes and the regulation of sexsteroid and gonadotropin hormone production.
 2. Interpret laboratory results with regard to suspected gonadal disorders, given a patient's presentation and clinical data.
 3. Select appropriate laboratory tests to effectively evaluate or monitor patients with suspected gonadal disease.
 4. Summarize causes of infertility in both males and females.
- J. **Adrenal Function:** Explain the adrenal gland's function in maintaining blood pressure, potassium, glucose and homeostasis.
1. Discuss the pathophysiology of adrenal cortex disorders, namely Cushing's syndrome and Addison's disease.
 2. Interpret laboratory data, predicting a correct diagnosis of primary, secondary Cushing's disease or Addison's disease.
 3. Differentiate the adrenal enzyme deficiencies and their blocking pathways in establishing a diagnosis.
 4. Apply knowledge of adrenal function to address case studies.
- K. **Tumor Markers:** Examine the commonly ordered tumor markers assayed in the clinical laboratory. Discuss the pathophysiology of tumors presented including the role of tumor markers in cancer management.
1. Classify the major tumor types according to their associated marker and the clinical usefulness of that marker.

2. Specify the definitive laboratory test for making a diagnosis of cancer.
 3. Correlate tumor marker results with associated cancers.
- L. **Thyroid:** Discuss the biosynthesis, secretion, transport, and action of the thyroid hormones.
1. Specify the recommended diagnostic test to screen for thyroid dysfunction.
 2. Correlate laboratory information with suspected thyroid disorders.
 3. Differential between primary, secondary and tertiary thyroid disorders.
 4. Apply theoretical knowledge of thyroid function to case studies presented.
- M. **Parathyroid:** Summarize the regulation of blood calcium by hormonal control, including the consequences of abnormal hormones.
1. Explain the role of Vitamin D as it relates to Calcium and PTH in the feedback loops.
 2. Describe the endocrine function and physiology of the parathyroid gland.
 3. Discuss laboratory tests used to evaluate the function of the parathyroid gland.
 4. Correlate laboratory results to clinical disease states involving the parathyroid gland.
 5. Apply theoretical knowledge of parathyroid function to solve case studies presented.
- N. **Therapeutic Drug Monitoring:** Examine the concept and clinical utility of therapeutic drug monitoring (TDM).
1. Discuss the characteristics of a drug that make therapeutic drug monitoring essential.
 2. Identify the key factors that influence the absorption of an orally administered drug.
 3. Relate factors that influence the rate of drug elimination.
 4. State specimen collection and handling requirements for therapeutic drug monitoring.
 5. Correlate drug concentrations to pharmacokinetic and pharmacodynamic parameters.
 6. Apply knowledge of therapeutic drug monitoring to interpret laboratory results.
- O. **Toxicology:** Categorize common toxins or poisons with physiological effects and pathological mechanisms.
1. Discuss specimen collection, handling, and processing for toxicology testing.
 2. Evaluate toxicity in the clinical laboratory when given patient test results.
 3. Specify the role of the laboratorian in the evaluation of exposure to toxins and poisons.
 4. Correlate patient results to suspected poisoning cases, and recommend additional testing
- P. **Body Fluids:** Identify the source of body fluids that are routinely analyzed in the clinical laboratory.
1. Describe the physiologic purpose of amniotic fluid, cerebrospinal fluid, sweat, synovial fluid, pleural fluid, pericardial fluid and peritoneal fluid.
 2. Discuss the clinical utility and methods used to test amniotic fluid, cerebrospinal fluid, sweat, synovial fluid, pleural fluid, pericardial fluid and peritoneal fluid.
 3. Correlate patient status when given appropriate laboratory results obtained from discussed fluids.
 4. Differentiate between a transudate and an exudate, both in terms of their respective causes and laboratory results associated with each.
- Q. **Customer Service:** Explain the value of good customer service in a laboratory.
1. Identify who are the clinical laboratory's "customers".
 2. Discuss how MLT's can use good customer service, given scenarios of laboratory situations.

Student Learning Outcomes:

Identify normal and abnormal patient laboratory results and correlate these results with possible disease states.

HTEC 85D: Clinical Chem 2 Lecture Student Responsibilities:

1. Be prepared to spend 8-12 hours per week using and studying course material.
2. Attend all classes starting April 8 – June 24, 2024
3. **Sign in on the attendance sheet at the beginning of class.** Your signature is proof of attendance. *For online courses, log into the online class with your name so it can be documented.*
4. Arrive on time for the lecture session.
 - a. Complete all reading and homework assignments. Arrive prepared – read the assigned text chapters for the session. Have any questions ready for the session scheduled
 - b. An unexcused absence results in an **automatic drop** from the course
 - i. Due to the rapid pace of the course, make-up sessions will not be possible - catastrophic occurrences will be dealt with individually.
 - ii. Any missed lecture time "makeup" should be initiated by the student and arranged with your instructor. **No initiation, no credit. Please notify the instructor in advance for missed classes.** Homework can be faxed/scanned/e-mailed to get full credit.
5. **Quizzes may be given during the first 15 minutes of class.**
 - a. **Any portion of any exam cannot be copied by the student via cell phone or any other means.** (students are **not allowed** to copy or remove the questions from class. Students are allowed to write only on the exam.)
 - b. All exams are not to leave the classroom but can be available upon the request of the student.
 - c. **Online quiz assignments may be given via Canvas. No late quiz submissions will be accepted.**
6. **Homework will be collected at the beginning of each session. No late homework will be accepted.** No homework, no credit.
 - a. All homework turned in will be each student's individual work. Any work received that is a duplicate of another student (exact wording throughout majority of homework) will result in a zero for both students.
 - b. **All homework assignments will be typed and in ink.**
 - i. The exception will be the problem sets: Pencil is accepted
 - ii. Complete each problem by illustrating all steps in your question as required. Errors should be crossed through, reported correctly and initialed.
7. **All Exams (Exam 1, Exam 2, & Final Exam) will be conducted live, in-person, & on campus in the designated De Anza Room S73 at the regularly scheduled class time.** There are absolutely no late or make-up quizzes, exams, or assignments. The final exam date and time have been determined and mandated by the college. No early/late final exam may be scheduled.
8. To pass this lecture course, you must have a grade of 75% (or greater). Successful completion of this course (along with HTEC 85B) is required to enroll in Clinical Chemistry Practicum (HTEC 285)
9. *For online classes (including exams), students may be required to enable their cameras during the duration of the class or examination*

I have read the expectations noted above and understand their intent.

Print your name: _____

Student signature: _____ **date:** _____