

CHEM 414: Biochemistry**Instructor: Dr. Thomas West****Office:** STC 302**E-mail:** Thomas.West@tamuc.edu**Phone:** 903-886-5381**FAX:** 903-468-6020**Office Hours:** T, R, 9:30 am-12 pm**Class Meetings:** Mon, Wed and Fri 1:00-1:50 PM; **Location:** STC 123**CHEM 414 Laboratory:** W 2:00-5:50 PM; **Location:** STC 324

Mon, Wed and Fri 1:00-1:50 PM Location: STC 123

COURSE MATERIALS**Required Text Book:** BIOCHEMISTRY by Berg, Jeremy M.; Tymoczko, John L.; and Stryer, Lubert. New York: W. H. Freeman and Co: 8th edition**For CHEM 414L:**

Biochemistry Laboratory 3622/4560 by Author(s): Mark Demarest

ISBN: 978-0-7575-7929-5

Recommended for additional reading

Lehninger, Principles of Biochemistry, Fourth Edition

Biochemistry by Garrett and Grisham.

Biochemistry by Mathews and Van Holde

COURSE DEFINITION

Structure and function of large and small biomolecules involved in metabolism and information transfer in living organisms. The course treats both chemical and biological processes and their mechanisms. For students majoring in chemistry and life sciences, especially those interested in scientific, medical, or similar professional career.

CREDITS: 4 Course Credits (3 Course Credits for Class and 1 Course Credit for Laboratory)**PREREQUISITES OR CO-REQUISITES:** CHEM 212, CHEM 351, and MATH 192 or consent of the instructor.**COURSE DESCRIPTION**

This course in biochemistry is intended to provide undergraduate students with a foundation and in depth knowledge of biochemistry. This course will be covering many aspects of biochemistry, including: biomolecules and metabolism. The course consists of lectures sessions and the topic covered will be given in details in the course schedule. This course will also be combined with the **Biochemistry laboratory course** includes Laboratory safety, design of experiments, data analysis, chromatographic methods; electrophoresis; spectrophotometry; enzyme purification; and characterization of proteins, and lipids. This laboratory course is intended to provide a foundation of knowledge of macromolecules and also to learn some molecular biological techniques which will be very beneficial to relate lectures to real world applications. There will be also laboratory-related lectures during the time scheduled for the laboratory sessions. These

lectures are intended to describe the experiments, to learn how to analyze your data and draw conclusions.

STUDENT LEARNING OUTCOMES

The main objectives of this course are to provide a basic foundation and understanding of the principles of modern biochemistry necessary for further work in the biochemical/ biomedical areas. Unlike much earlier chemistry the material is often conceptually complex and not yet amenable to straightforward mathematical interpretation. Accordingly, the students may find the material more heavily descriptive than in their earlier chemical studies. By the end of this course the students will have a better understanding of the structure and function of the biological macromolecules its metabolism and biosynthesis.

Student Learning Outcomes (SLO)

At the completion of this course students will be able to:

- Identify the levels of structure in proteins and explain the structural stabilization.
- Describe the relationship of structure and function of proteins.
- Interpret plots of enzyme kinetic data.
- Describe the primary metabolic pathways of major molecular classes.
- Perform various techniques to separate, characterize and quantitate proteins.
- Perform techniques to characterize and quantitate lipids.
- Communicate experimental results to the peers.

ATTENDANCE POLICY

All students are expected to attend classes on a regular basis. According to the TAMU-Commerce Procedure A13.02, if a student has excessive absences, the instructor may drop the student from the course. The instructor will only excuse an absence if the student provides, with appropriate document, an excusable reason allowed by the TAMU-Commerce Procedure A13.02.

COURSE REQUIREMENTS

Exams

There will be four equally weighted exams given, three during the course and the fourth at the final exam time. The students will be expected to be available and prepared for the exams at the specified times. *Missing an exam will result in a 0 score for that exam unless due to illness as documented by a doctor's note and the student notifies the instructor of the illness before the exam (e-mail, phone message, etc.).* Make-up exams will not be given ordinarily. The exams will contain a mix of objective and subjective question (multiple choice questions, true-false questions, long (explanation) questions, short (formulas and definitions) questions and graphical/diagrammatic questions.

Grading

For students enrolled in CHEM 414, your final grade will be based on your performance in 3 exams (20% each), laboratory (25%) and the final exam (15%). Grading will be based on a standard percentage scale: 100-90 = A; 89-80 = B; 79-70 = C; 69-60 = D; 59-below = F. Dishonest scholarship will earn an automatic zero (0) and initiate prosecution to the fullest

extent. Incomplete grades may be given only if the student has a current average $\geq 70\%$ and is precluded from completion of the course by a documented illness or family crisis.

COURSE CALENDAR FOR CHEM 414

All dates and assignments are tentative and subject to change

Date/Topic(s)/Chapter

August

31-Biochemistry, an Evolving Science-Chapter 1

September

2-Biochemistry, an Evolving Science-Chapter 1

4- Water and biological buffers-Chapter 1

7-No Class (Labor Day)

9-Water and biological buffers-Chapter 1

11-Protein Composition & Structure-Chapter 2

14-Protein Composition & Structure-Chapter 2

16-Protein Composition & Structure-Chapter 2

18-Exploring Proteins & Proteomes-Chapter 3

21-Exploring Proteins & Proteomes-Chapter 3

23-Exploring Proteins & Proteomes-Chapter 3

25-Review

28-FIRST EXAM

30-Nucleic Acids-Chapters 4, 5, 6

October

1-Nucleic Acids-Chapters 4, 5, 6

5-Enzymes-Chapters 8, 9, 10

7-Enzymes-Chapters 8, 9, 10

9-Enzymes Chapters 8, 9, 10

12-Enzymes Chapters 8, 9, 10

14-Hemoglobin-A Protein in Action-Ch. 7

16-Hemoglobin-A Protein in Action-Ch. 7

19-Review

21-SECOND EXAM

23-Carbohydrates-Chapter 11

26-No Class (Welch Conference)

28-Carbohydrates-Chapter 11

30-Lipids & Cell Membranes-Chapter 12

November

2-Channels & Pumps-Chapters 13, 14

4-Channels & Pumps Chapters 13, 14

6-Metabolism-cofactors, energy-Chapter 15

9-Metabolism-cofactors, energy-Chapter 15

11-Glycolysis and Gluconeogenesis-Chapter 16

13-Glycolysis and Gluconeogenesis-Chapter 16

16-Review

18-THIRD EXAM

20-Citric Acid Cycle-Chapter 17

23-Citric Acid Cycle-Chapter 17

25-No Class (Thanksgiving Holiday)

27-No Class (Thanksgiving Holiday)

30-Oxidative Phosphorylation-Chapter 18

December

2-Oxidative Phosphorylation-Chapter 18

4-Fatty Acid Metabolism-Chapter 22

7-Fatty Acid Metabolism Chapter 22

9-Urea Cycle, Protein/Amino Acid Catabolism-Chapter 23

11-Review

WEEK OF DECEMBER 14-18-CUMULATIVE FINAL EXAM

TENTATIVE CHEM 414 LABORATORY SCHEDULE

September

2-Lab Safety and Best Practices

9-Analytical Error

16-Acid-Base Chemistry and Buffering Systems

23-Discussion/**lab report 1 due 9/30**

30-Gel Filtration Chromatography

October

7- Titration and Thin-Layer Chromatography of Amino Acids

14- Discussion/**lab report 2 due 10/21**

21-Enzyme Kinetics

28-Lipid Extraction

November

4-Discussion/**lab report 3 due 11/11**

11-Affinity Chromatography

18-Gel Electrophoresis

25-No Class (Thanksgiving Holiday)

December

2-Discussion/Review/**lab report 4 due 12/9**

9-Exam

CHEM 414L GRADING

4 Laboratory Reports (20 points each) + Exam (20 points) x 25% = Total Laboratory Points to be counted towards your CHEM 414 Final Grade.

STUDENT CONDUCT POLICY

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment (see Student's Guidebook, Policies and Procedures, Conduct). Any student engaging in disruptive behavior will be dismissed from class on a first offense. A second offence may constitute dismissal from the course with a failing grade.

ACADEMIC MISCONDUCT

Academic cheating, plagiarism and other types of academic misconduct may result in the student being removed from the class with a failing grade. Extreme cases of academic misconduct may result in suspension or expulsion from the University as described in the Code of Student Conduct section of the Student's Guidebook.

STUDENTS WITH DISABILITIES

The Americans with Disabilities Act (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 of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

Texas A&M University-Commerce

Gee Library, Room 132

Phone: (903) 886-5150 or (903) 886-5835

Fax: (903) 468-8148

E-Mail: StudentDisabilityServices@tamuc.edu

Please advise the instructor of any special problems or needs at the beginning of the semester.

NONDISCRIMINATION NOTICE

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity or gender expression will be maintained.