

Sul Ross State University
Syllabus for CHEM 4301 (Spring 2015)
(Alpine and Midland)

Class: Biochemistry I
Room: WSB 321
Time: MWF 11:00-11:50am

Instructor: Dr. David Leaver
Office: WSB 318
Office Hours: MWF 3:00-5:00pm
Email: djl14jh@sulross.edu
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Program Learning Objectives (PLO):

A student graduating with the chemistry major is expected to demonstrate that s(he) is able to:

1. Explain atomic and molecular structures, bonding, thermodynamics, chemical equilibria and kinetics, stoichiometry, and electrochemical processes;
2. Write and explain organic reactions, stereochemistry, and reactions in biological systems;
3. Use essential modern instruments to perform chemistry experiments in the laboratory;
4. Summarize basic principles of research design and analyze experimental data using appropriate computer programs (e.g. Excell, Sigma-plot, etc.) in regards to the chemistry discipline.

Student Learning Objectives (SLO):

At the end of this course, a student should have a good understanding of:

1. Chemistry and biological functions of water, amino acids, and proteins
2. Enzyme reactions, kinetics and inhibition
3. The structure and biological function of carbohydrates and lipids
4. Biological membranes and cellular transport
5. Storage and transfer of biological information (DNA replication/transcription and RNA translation)

TEXT:

Concepts in Biochemistry by Rodney Boyer (3rd Edition; recommended)

Or

Biochemistry by Garrett and Grisham (5th Edition)

The following chapters will be covered: (According to Boyer)

Chapter 1: Biochemistry: From Atoms to Molecules to Cells (SLO 1)

Chapter 2: Biomolecules in Water (SLO 1)

Chapter 3: Amino Acids, Peptides, and Proteins (SLO 1)

Chapter 4: Protein Architecture and Biological Function (SLO 1 and 2)

Chapter 5: Enzyme I: Reactions, Kinetics, and Inhibition (SLO 2)

Chapter 6: Enzyme II: Coenzymes, Regulation, Abzymes, and Ribozymes (SLO 2)

Chapter 7: Carbohydrates: Structure and Biological Function (SLO 1 and 3)

Chapter 8: Lipids: Structure and Biological Function (SLO 1 and 3)

Chapter 9: Biological Membranes and Cellular Transport (SLO 1 and 4)

Chapter 10: DNA and RNA: Structure and Function (SLO 5)

Chapter 11: DNA Replication and Transcription (SLO 5)

Chapter 12: Translation of RNA (SLO 5)

This course is designed to fulfill PLO 1 and 2

ATTENDANCE PRERESQUITE: BEING ABSENT FROM MORE THAN 9 LECTURES WILL RESULT IN FAILING THE COURSE.

HOMEWORK:

Twelve homework assignments will be assigned throughout the semester and will be equal weight per assignment. All of the combined homework assignments will contribute 20% of your final mark.

EXAMINATIONS:

There will *three in-course* examinations and *a final* examination. **NO MAKE-UP EXAMS WILL BE GIVEN.** The final is mandatory and will be comprehensive.

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 20%

Each Midterm Exam (15%): 45%

Final Exam: 35%

Midterm Exam I: Wednesday, February 18th

Midterm Exam II: Friday, March 13th

Midterm Exam III: Wednesday, April 15th

Final Exam: Wednesday, May 13th

Course Calendar

Lecture 1 (January 21): Discussion on Syllabus, importance and historic background of biochemistry

Lecture 2 (January 23): Chemical elements in biomolecules, major classes of biological macromolecules, overview of organelles, cells, and organisms

Lecture 3 (January 26): Preview of storage and transfer of biological information + revision on chapter 1

Lecture 4 (January 28): Biological roles of water and cellular reactions of water
(Homework 1 due)

Lecture 5 (January 30): overview of pH and pK, buffer and titration curves, General structure of amino acids, properties of α -amino acids, classification of amino acids, reactivity and analysis of amino acids

Lecture 6 (February 02): Revision on Chapter 2 + peptide bonds in polypeptides and proteins

Lecture 7 (February 04): Preview of protein function and structural properties of proteins
(Homework 2 due)

Lecture 8 (February 06): Structural elements of proteins-primary, secondary, tertiary and quaternary structures, protein folding process

Lecture 9 (February 9): Understanding the relation between protein structure and biological function with few examples + revision on Chapter 3

Lecture 10 (February 11): General principles of protein design, elements of secondary structure and protein tertiary structure **(Homework 3 due)**

Lecture 11 (February 13): Protein quaternary structure and more examples of protein structure and related biological function

Lecture 12 (February 16): Exam revision on Chapters 1-3

Lecture 13 (February 18): Exam I (Chapters 1-3)

Lecture 14 (February 20): Revision on Chapter 4 + roles and properties of enzymes

Lecture 15 (February 23): Fundamental principles of enzyme action and kinetic properties of enzymes (**Homework 4 due**)

Lecture 16 (February 25): Substrate binding and enzyme action, enzyme inhibition

Lecture 17 (February 27): Revision on Chapter 5

Lecture 18 (March 02): Role of coenzymes in the activity of enzymes, allosteric enzymes (**Homework 5 due**)

Lecture 19 (March 04): Cellular regulation of enzymes, introduction to site-directed mutagenesis, ribozymes, and practical uses of enzymes

Lecture 20 (March 06): Revision on Chapter 6

Lecture 21 (March 9): Introduction to carbohydrate chemistry, classification of carbohydrates, reactions of monosaccharides (**Homework 6 due**)

Lecture 22 (March 11): Exam revision on Chapter 3-6

Lecture 23 (March 13): Exam II (Chapters 3-6)

March 16-20th is Spring Break (No classes)

Lecture 24 (March 23): Structures and functions of polysaccharides and glycoproteins

Lecture 25 (March 25): revision on Chapter 7 + Chemical structures, physical and chemical properties of fatty acids

Lecture 26 (March 27): Polar and non-polar lipids (**Homework 7 due**)

Lecture 27 (March 30): Revision on Chapter 8 + Chemical structures and biological properties of steroids and other lipids

Lecture 28 (April 01): Molecular composition, architecture, and biological functions of cell Membranes (**Homework 8 due**)

Lecture 29 (April 03): Modes of action used by membrane transport proteins

Lecture 30 (April 06): Revision on Chapter 9 + Chemical structures of DNA and RNA

Lecture 31 (April 08): Structural elements of DNA and RNA, DNA and RNA cleavage by nucleases and nucleic acid-protein complexes.

Lecture 32 (April 10): Revision on Chapter 10

Lecture 33 (April 13): Exam revision on Chapters 7-9 (**Homework 10 due**)

Lecture 34 (April 15): Exam III; Chapters 7-9

Lecture 35 (April 17): DNA replication- machinery and process

Lecture 36 (April 20): DNA damage and repair

Lecture 37 (April 22): Cellular and molecular mechanism for RNA synthesis, posttranscriptional modifications of RNA

Lecture 38 (April 24): Revision on Chapter 11

Lecture 39 (April 27): Cellular and molecular components and general features of protein synthesis process (**Homework 11 due**)

Lecture 40 (April 29): Post-translational processing of proteins, regulation of protein synthesis and gene expression

Lecture 41 (May 01): Revision on Chapter 12

Lecture 42 (May 04): Final Exam Revision (Chapters 1-6); (Homework 12 due)

Lecture 43 (May 06): Final Exam Revision (Chapters 7-12)

Final Exam (May 13): At 10:15 am; Chapters 1-12

Distance Education Statement: Students enrolled in distance education courses have equal access to the university's academic support services, library resources, and instructional technology support. For more information about accessing these resources, visit the SRSU website. Students should submit online assignments through Blackboard or SRSU email, which require secure login information to verify students' identities and to protect students' information. Proctored exams will be organized for the three midterm exams and for the final exam. The procedures for filing a student complaint are included in the student handbook. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website.

Students with Special Needs: *Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Mary Schwartze, M. Ed., L.P.C., in Counseling and Accessibility Services, Ferguson Hall, Room*

112. *The mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. Telephone: 432-837-8203. E-mail: mschwartz@sulross.edu .*

Scholastic Dishonesty: Students who violate the University rules on scholastic dishonesty are subject to penalties, including the possibility of an **F** in the course and/or dismissal from the University.