OBJECTIVES

Student Learning Objectives (SLO):

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

1. Organic Chemistry—Students will be able to draw organic molecular structures and explain organic reactions, stereochemistry, structural analysis and reactions in biological systems.

2. Inorganic Chemistry—The student will be able to demonstrate understanding of coordination chemistry, valence theory, elementary actions and advanced molecular theory.

3. Analytical Chemistry—The student will be able to demonstrate an understanding of theory of analytical chemistry and conduct analytical analysis, including data analysis and calibration, equilibrium chemistry, gravimetric analysis, titrimetric analysis, spectroscopic analysis, and electrochemical analysis.

4. Physical Chemistry—The student will be able to demonstrate an understanding of the application and theory of physical chemistry, including topics such as atomic structure, electrochemistry, surface chemistry, solid-state chemistry, and thermodynamics.

5. Research—The student will collect and analyze published chemical literature and undertake a chemistry research project.
**Biochemistry I Learning Objectives:**

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)
6. SciFinder (Chemical Database)

**Calculator:** A scientific calculator is required for this course.

**Cell phones ARE NOT** permitted for use in exams and should be turned off during class time.

**REQUIRED TEXT:**


The following chapters will be covered from “Lehninger Principles of Biochemistry” 6th Edition:

**Chapter 1:** The Foundations of Biochemistry

**Chapter 2:** Water

**Chapter 3:** Amino Acids, Peptides, and Proteins

**Chapter 4:** The Three-Dimensional Structure of Proteins

**Chapter 5:** Protein Function

**Chapter 6:** Enzymes

**Chapter 7:** Carbohydrates and Glycobiology
Chapter 10: Lipids
Chapter 11 Biological Membranes and Transport
Chapter 8: Nucleotides and Nucleic Acids
Chapter 24: Genes and Chromosomes
Chapter 25: DNA Metabolism
Chapter 26: RNA Metabolism (If time permits)

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

HOMEWORK:
Thirteen (13) 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. Homework must be completed in PEN!

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

RESEARCH ESSAY: Due Monday 29th April @ 5:00 PM
You are required to prepare a 5 page (minimum) paper (excluding bibliography) that summarizes your findings in the literature of a particular topic in the field of biochemistry. The topic can be chosen by talking to Dr. Leaver directly or by taking one of the assigned projects. The paper should be typed with one & a half or double line spacing and in Times New Roman or Arial font. Margins should be 1 inch all around. Your bibliography should have > 5 peer-reviewed articles or citations that pertain to your topic of interest. Website citations WILL NOT be accepted

You will need to turn in a copy (pdf) of the journal articles (email or hardcopy) that you cite to Dr. Leaver. More information will be provided in class and in Blackboard.
**SCORING RUBRIC**

60%: Relevant biochemical literature/examples discussed in paper, concise up-to-date analysis of literature / field of the disease being investigated/molecular understanding of the disease and how to treat it (or is it currently untreatable?), current drugs (include some structures) or current development of drugs, issues concerning this disease &/or how to treat it.

20%: Grammar and organization of the essay, relevant tables, figures, etc.

20%: Bibliography per ACS standards and all references as .pdf are emailed to Dr. Leaver on time.

**PERCENTAGE BREAKDOWN OF MARKS FOR BIOCHEMISTRY II:**

Homework: 20%

Research Essay: 15%

Each Midterm Exam (15%): 45%

Final Exam: 20%

**Midterm Exam I:** Wednesday, February 20th

**Midterm Exam II:** Wednesday, March 27th

**Midterm Exam III:** Wednesday, April 17th

**Research Essay:** Monday, April 29th (Due 5:00 pm)

**Final Exam:** Tuesday, May 14th 10:15am -12:15 pm

**Course Calendar**

**Lecture 1 (January 23):** Discussion on Syllabus, importance and historic background of Biochemistry, cellular foundations, overview of organelles, cells, and organisms

**Lecture 2 (January 25):** Chemical elements in biomolecules, major classes of biological macromolecules, chemical and physical foundations.
Lecture 3 (January 28): Preview of storage and transfer of biological information, genetic foundations + revision on chapter 1

Lecture 4 (January 30): Biological roles of water and cellular reactions of water
(Homework 1 due)

Lecture 5 (February 1): 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 4): Revision on Chapter 2 + peptide bonds in polypeptides and proteins.
(Homework 2 due)

Lecture 7 (February 6): Preview of protein function and structural properties of proteins

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

Lecture 9 (February 11): Revision on Chapter 3 General principles of protein design
(Homework 3 due)

Lecture 10 (February 13): Elements of secondary structure and protein tertiary structure

Lecture 11 (February 15): Protein quaternary structure and more examples of protein structure and related biological function, revision on Chapter 4 (Homework 4 due)

Lecture 12 (February 18): Exam revision on Chapters 1-3

Lecture 13 (February 20): Exam I (Chapters 1-3, subject to change)

Lecture 14 (February 22): Understanding the relation between protein structure and biological function with few examples

Lecture 15 (February 25): More examples of protein function, revision on Chapter 5, roles and properties of enzymes

Lecture 16 (February 27): Fundamental principles of enzyme action and kinetic properties of enzymes

Lecture 17 (March 1): Substrate binding and enzyme action, enzyme inhibition, enzymatic reaction examples (Homework 5 due)

Lecture 18 (March 4): Role of coenzymes in the activity of enzymes, allosteric enzymes

Lecture 19 (March 6): Cellular regulation of enzymes, more enzyme reactions and practical uses of enzymes

Lecture 20 (March 8): Revision on Chapter 6 (Homework 6 due)
March 11-15th is Spring Break at MC. SRSU classes are still on!

Lecture 21 (March 11): Introduction to carbohydrate chemistry, classification of carbohydrates, reactions of monosaccharides

Lecture 22 (March 13): Structures and functions of polysaccharides and glycoproteins

Lecture 23 (March 15): Revision on Chapter 7, Chemical structures, physical and chemical properties of fatty acids (Homework chapter 7 due)

March 18-22nd is Spring Break (No classes)

Lecture 24 (March 25): Exam revision on Chapters 4-7

Lecture 25 (March 27): Exam II (Chapters 4-7, subject to change)

Lecture 26 (March 29): Polar and non-polar lipids, structural lipids in membranes, and importance of lipids

Lecture 27 (April 1): Working with lipids and revision on Chapter 10

Lecture 28 (April 3): Molecular composition, architecture, and biological functions of cell (Homework chapter 10 due)

Lecture 29 (April 5): Membrane dynamics

Lecture 30 (April 8): Modes of action used by membrane transport proteins

Lecture 31 (April 10): Revision on Chapter 11 (Homework Chapter 11 due), chemical structures of DNA and RNA, Structural elements of DNA and RNA

Lecture 32 (April 12): Functions of nucleotides, revision on Chapter 8, (Homework Chapter 8 due)

Lecture 33 (April 15): Exam revision on Chapters 8, 10, 11

Lecture 34 (April 17): Exam III; Chapters 8, 10, 11 (subject to change)

Friday 19th April is Good Friday (No Class)

Lecture 35 (April 22): Chromosomal elements, DNA supercoiling

Lecture 36 (April 24): Structure of chromosomes

Lecture 37 (April 26): Revision on Chapter 24, (Homework Chapter 24 due)

Lecture 38 (April 29): DNA replications, DNA repair, DNA replication. Research Essay Is Due @ 5:00 pm

Lecture 39 (May 1): Revision on Chapter 25, DNA-dependent synthesis of RNA (Homework Chapter 25 due)
Lecture 40 (May 3): RNA processing and RNA-dependent synthesis of RNA and DNA
Lecture 41 (May 6): Revision on Chapter 26, Final Exam Revision (Homework Chapter 26 due)
Lecture 42 (May 8): Final Exam Revision
Final Exam (May 14): At 10:15 am-12:15 pm (Comprehensive)

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. 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 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: mschwartze@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. All assignments (including homework) need to be individually completed and not copied from another student’s work. Electronic submission of homework is accepted after hours (not recommended), but must be hand written and scanned (either with a scanner or a smartphone) and emailed to Dr. Leaver at: david.leaver@sulross.edu. [.pdf files are the recommended format for electronic submission of assignments]. Homework electronically completed in Microsoft Word or other similar programs will NOT be accepted.