

SUL ROSS STATE UNIVERSITY
Syllabus for Biochemistry I-21489
CHEM 4301 (Spring 2022)
(Alpine and Midland)

Biochemistry I: Lecture
Room: WSB 101
Time: T/TR 9:30 am -10:45 pm
Date: Jan. 10 to May 4

Instructor: Dr. Hong Young Chang
Office: WSB 219
Email: hxc19tv@sulross.edu
Office Hour: M-TR 2:00-6:30pm
(In person or zoom)
(Appointments only)

(The first week (Jan. 10 to Jan. 14) is on-line class (Blackboard)
(Revert to Face-to-Face: Jan.18 to May 4)

It is strongly recommended to wear a suitable mask/face on campus (including lectures & laboratories) while you took COVID-19 Vaccine shots. There will be COVID-19 Tests in this semester. If you have tested positive for COVID-19 (or have been exposed to someone who has tested positive for COVID-19), please do self-report: <https://srinfo.sulross.edu/covid-19/self-report/>. In order to do self-report, you will need to be signed in with your SRSU credentials (yellow “log in” button on the bottom left-hand side of the above website). Other web-site of SRSU is also helpful for COVID-19.

[COVID Regulations - SUL ROSS](#)

[Free COVID-19 testing for all SRSU students, faculty and staff comes to Alpine, August 27-28 -](#)

Disinfection of Classroom Surfaces: Each person should disinfect their space at the beginning and end of every class meeting. The university has provided

disinfectant wipes in the classroom. When you enter the classroom, please take a wipe and use it to clean your space before settling in. Please wipe down your space before you leave the classroom.

Orderly Dismissal: When class is over, Dr. Chang will dismiss students row by row. Please wipe down your desk/leave when Dr. Chang dismisses your row.

Food & Drinks: There will be no eating or drinking in the classroom. If you need to take a sip of your drink during class time, you may leave the room to do so.

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 SRSU are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook.

SRSU Disability Services: ADA (Americans with Disabilities Act):

Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Rebecca Greathouse Wren, LPC-S, SRSU's Accessibility Services Coordinator at 432-837-8203 (please leave a

message and we'll get back to you as soon as we can during working hours), or email rebecca.wren@sulross.edu. Their office is located on the first floor of Ferguson Hall (Room 112), and our mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas, 79832.

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.*

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.

BSc in Chemistry Marketable Skills

1. Students will become good at punctuality and time management.
2. Students will analyze &/or synthesize molecules and perform spectroscopic characterization and interpret their results scientifically.
3. Students will become proficient at writing scientific papers and to identify appropriate references for their paper.
4. Students will be become proficient at orally presenting scientific topics including the use of visual aids.

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), RCSB PDB bank, and the Protein Data Bank (NCBI)

Required Text Book:

“Lehninger Principles of Biochemistry” 6th Edition, David L. Nelson & Michael M. Cox, 2013, W.H. Freeman and Company, New York.

The SRSU library has one copy of this textbook in the “Textbook Collection” section. Please ask the library front desk if you need help finding this textbook.

Optional Reading:

“Concepts in Biochemistry” by Rodney Boyer, 2006, (3rd Edition), John Wiley & Sons, INC.

SRSU Library Services: The Sul Ross Library offers FREE resources and services to the entire SRSU community. Access and borrow books, articles, and more by visiting the library’s website, library.sulross.edu. Off-campus access requires your LoboID and password. Check out materials using your photo ID. Librarians are a tremendous resource for your coursework and can be reached in person, by email (srsulibrary@sulross.edu), or phone (432-837-8123).

ChemDraw is a computer program that you can use to draw organic structures, organic reactions, etc. You can download ChemDraw onto your own personal computer (PC or Mac):

<http://sitelicense.cambridgesoft.com/sitelicense.cfm?sid=3000>

Make sure you follow the requirements for the password and use your SRSU email address to register. Alternatively, you can access **ChemDraw in the GIS lab** (computer room next to the chem TA room) by searching for “ChemDraw” whenever there is no class in that room (open computer lab when no classes are being taught).

PyMOL is a free and open-source molecular graphics system for visualization, animation, editing, and publication-quality imagery. PyMOL is scriptable and can be extended using the Python language. Supports Windows, Mac OSX, Unix, and Linux. You can download PyMOL from the following website: [PyMOL | pymol.org](http://pymol.org)

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.

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

Homework: Twelve (12) homework will be assigned throughout the semester. All of the homework will contribute 20% of your final mark. Homework must be completed in PEN! You need to keep the due day.

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

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 20%

Each Midterm Exam (20%): 60%

Final Exam: 20%

Midterm Exam I: Tuesday, February 8th

Midterm Exam II: Thursday, March 3rd

Midterm Exam III: Tuesday, April 5th

Final Exam: Monday, May 2nd 8:00 am -10:00 am

Course Calendar

Lecture 1 (January 11): Discussion on Syllabus, importance and historic background of Biochemistry, cellular foundations, overview of organelles, cells, and organisms (**online recording**)

Lecture 2 (January 13): Chemical elements in biomolecules, major classes of biological macromolecules, chemical and physical foundations (**online recording**)

Lecture 3 (January 18): Preview of storage and transfer of biological information, genetic foundations (**Homework Ch.1 due**)

Lecture 4 (January 20): Biological roles of water and cellular reactions of water, Overview of pH and pK, buffer and titration curves

Lecture 5 (January 25): General structure of amino acids, properties of α -amino acids, classification of amino acids, reactivity and analysis of amino acids

Lecture 6 (January 27): Peptide bonds in polypeptides and proteins. (**Homework Ch.2 due**)

Lecture 7 (February 1): Structural elements of proteins-primary, secondary, tertiary and quaternary structures, protein folding process

Lecture 8 (February 3): General principles of protein design, elements of secondary structure and protein tertiary structure, **Exam Revision on Chapters 1, 2, & 3**

Lecture 9 (February 8): Exam I (Chapter 1, 2, &3) (Homework Ch.3 due)

Lecture 10 (February 10): Protein quaternary structure and more examples of protein structure and related biological function (**Homework Ch.4 due**)

Lecture 11 (February 15): Understanding the relationship between protein structure and biological function with few examples, Roles and properties of enzymes, fundamental principles of enzyme action

Lecture 12 (February 17): Substrate binding and enzyme action, enzyme inhibition, enzymatic reaction examples (**Homework Ch.5 due**)

Lecture 13 (February 22): Role of coenzymes in the activity of enzymes, allosteric enzymes, cellular regulation of enzymes,

Lecture 14 (February 24): Kinetic properties of enzymes, more enzyme reactions and practical uses of enzymes

Lecture 15 (March 1): Exam Revision on Chapters 4, 5, & 6 (Homework Ch.6 due)

Lecture 16 (March 3): Exam II (Chapter 4, 5, & 6)

NO CLASS: SPRING BREAK (March 7 to March 11)

Lecture 17 (March 15): Introduction to carbohydrate chemistry, classification of carbohydrates, reactions of monosaccharides

Lecture 18 (March 17): Structures and functions of polysaccharides and glycoproteins

Lecture 19 (March 22): Chemical structures, physical and chemical properties of fatty acids, polar and non-polar lipids, structural lipids in membranes, and importance of lipids (**Homework Ch.7 due**)

Lecture 20 (March 24): Molecular composition, architecture, and biological functions of cell (**Homework Ch.10 due**)

Lecture 21 (March 29): Membrane dynamics, modes of action used by membrane transport proteins.

Lecture 22 (March 31): **Exam revision on Chapters 7, 10, & 11 (Homework Ch.11 due)**

Lecture 23 (April 5): **Exam III (Chapter 7, 10, & 11)**

Lecture 24 (April 7): Chemical structures of DNA and RNA on Chapter 8

Lecture 25 (April 12): Structural elements of DNA and RNA, functions of nucleotides

Lecture 26 (April 14): chromosomal elements, DNA supercoiling, structure of chromosomes, DNA replications, DNA repair, DNA replication (**Homework Ch.8 due**)

Lecture 27 (April 19): DNA-dependent synthesis of RNA, RNA processing and RNA-dependent synthesis of RNA and DNA (**Homework Ch.24 due**)

Lecture 28 (April 21): **Final Exam Revision (Ch. 8, 24, & 25)**

Lecture 29 (April 26): **Final Exam Revision (Ch.1-7, 10, & 11)** (**Homework Ch.25 due**)

NO CLASS: DEAD DAY (April 28)

Final Exam (Comprehensive): Monday, May 2nd, 8:00 am -10:00 am