Sul Ross State University  
Syllabus for Biochemistry II: CHEM 4302 (Fall 2018)  
(Alpine and Midland)

Class: Biochemistry II  
Room: WSB 321 (Alpine)  
Time: MWF 11:00-11:50am

Instructor: Dr. David Leaver  
Office: WSB 318  
Office Hours: M-R 2:00-5:00pm  
Email: david.leaver@sulross.edu  
Office Phone: (432) 837-8115

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 II Learning Objectives:
At the end of this course, a student should have a good understanding of:
1. Signal transduction in GCPRs, receptor tyrosine kinases, gated ion channels and how sensory transduction in used in vision, olfaction and gustation
2. Bioenergetics and biochemical reaction types
3. Glycolysis, gluconeogenesis, and the pentose phosphate pathway
4. Principles of metabolic regulation, hormonal regulation, integration of mammalian metabolism and protein metabolism
5. Citric Acid Cycle
6. Fatty Acid Catabolism
7. Biosynthesis of lipids, amino acids, nucleotides and related molecules

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 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.

The following chapters will be covered:
Chapter 12: Biosignaling
Chapter 13: Bioenergetics and Biochemical Reaction Types
Chapter 14: Glycolysis, Gluconeogenesis, and the Pentose Phosphate Pathway
Chapter 15: Principles of Metabolic Regulation
Chapter 16: The Citric Acid Cycle
Chapter 17: Fatty Acid Catabolism
Chapter 18: Amino Acid Oxidation and the Production of Urea
Chapter 19.1-19.5: Oxidative Phosphorylation

Chapter 21: Lipid Biosynthesis

Chapter 22: Biosynthesis of Amino Acids, Nucleotides and Related Molecules

Chapter 23: Hormonal Regulation and Integration of Mammalian Metabolism

Chapter 20: Carbohydrate Biosynthesis and Plants and Bacteria (if time permits)

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

HOMEWORK:

Twelve (12) homework assignments will be assigned throughout the semester and will be equal weight per assignment. All of the combined homework assignments will contribute 23% of your final mark. Homework must be completed in PEN!

EXAMINATIONS:

There will be three in-course examinations and a final examination. The final is mandatory and will be comprehensive.

ORAL RESEARCH PRESENTATION (worth 15%):

Presentations to the whole class will be on Friday 30th November (Alpine) and Monday 3rd December (Midland).

PRESENTATION SLIDES MUST BE EMAILED TO DR. LEAVER BY 5:00 PM ON THURSDAY NOVEMBER 29TH.

A research based project that will involve searching relevant biochemical literature (SciFinder, EBSCO, etc.) on a relevant topic. The presentation will be orally presented to the whole class with the use of PowerPoint. You should have > 5 peer reviewed publications cited in your presentation. Duration of presentation should be ~ 10 minutes and more information will be provided in class and on Blackboard.
Scoring rubric for oral presentation:

60%: Relevant biochemical literature/examples discussed in presentation, 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.

40%: Delivery, flow of talk, quality pictures/figure/tables etc., and properly cited references (cited references MUST BE emailed to Dr. Leaver as .pdfs.)

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 23%
Oral Research Presentation: 15%
Each Midterm Exam (14%): 42%
Final Exam: 20%

EXAM SCHEDULE:
Midterm Exam I: Monday 24th September
Midterm Exam II: Wednesday 17th October
Midterm Exam III: Monday 19th November
Final Exam: Tuesday December 11th from 10:15 am -12:15 pm

Course Calendar
Lecture 1 (August 27): Discussion on syllabus, general features of signal transduction, G protein—coupled receptors (GPCRs) and secondary messengers
Lecture 2 (August 29): Receptor kinases, receptor guanylyl cyclases, cGMP, protein kinase G, multivalent adapter proteins and membrane rafts
Lecture 3 (August 31): Gated ion channels, integrins, regulation of transcription by nuclear hormone receptors
September 3: **NO CLASS: LABOR DAY HOLIDAY**
Lecture 4 (September 5): Sensory transduction in vision, olfaction and gustation, regulation of cell cycle by protein kinases

Lecture 5 (September 7): Oncogenes, tumor suppressor genes and apoptosis, revision on Chapter 12 (Homework Chapter 12 due)

Lecture 6 (September 10): Bioenergetics and thermodynamics, chemical logic and common biochemical reactions, phosphoryl group transfers and ATP

Lecture 7 (September 12): Biological oxidation-reduction reactions, revision on Chapter 13, Glycolysis

Lecture 8 (September 14): Glycolysis and gluconeogenesis (Homework Chapter 13 due)

Lecture 9 (September 17): Pentose phosphate pathway of glucose oxidation and revision of Chapter 14

Lecture 10 (September 19): Principles on metabolic pathways and analysis of metabolic control (Homework Chapter 14 due)

Lecture 11 (September 21): Exam revision

Lecture 12 (September 24): Exam Chapters 12-14

Lecture 13 (September 26): Coordinated regulation of glycolysis and gluconeogenesis and metabolism of glycogen in animals

Lecture 14 (September 28): Coordinated regulation of glycogen synthesis and breakdown, revision of Chapter 15

Lecture 15 (October 1): Citric acid cycle, biosynthesis of acetyl-coenzyme A (Homework Chapter 15 due)

Lecture 16 (October 3): Regulation of the citric acid cycle and the glyoxylate cycle

Lecture 17 (October 5): Revision on Chapter 16 and fatty acid catabolism
Lecture 18 (October 8): Oxidation of fatty acids, ketone bodies (Homework Chapter 16 due)
Lecture 19 (October 10): Revision on Chapter 17 and metabolic fates of amino groups
Lecture 20 (October 12): Nitrogen excretion and the urea cycle (Homework Chapter 17 due)
Lecture 21 (October 15): Exam Revision
Lecture 22 (October 17): Exam II (Chapters 15-17)
Lecture 23 (October 19): Pathways of amino acid degradation
Lecture 24 (October 22): Revision on Chapter 18, electron-transfer reactions in mitochondria and ATP biosynthesis
Lecture 25 (October 24): Regulation of oxidative phosphorylation, mitochondria in thermogenesis (Homework Chapter 18 due)
Lecture 26 (October 26): Steroid synthesis and apoptosis, revision on Chapter 19.
Lecture 27 (October 29): Biosynthesis of fatty acids and eicosanoids and biosynthesis of triacylglycerols (Homework Chapter 19 due)
Lecture 28 (October 31): Biosynthesis of membrane phospholipids, cholesterol, steroids, and isoprenoids
Lecture 29 (November 2): Revision on chapter 21, overview of nitrogen metabolism, biosynthesis of amino acids
Lecture 30 (November 5): Molecules derived from amino acids (Homework Chapter 21 due)
Lecture 31 (November 7): Biosynthesis and degradation of nucleotides, Revision on Chapter 22
Lecture 32 (November 9): Hormones and tissue-specific metabolism (Homework Chapter 22 due)
Lecture 33 (November 12): Hormonal regulation of fuel metabolism, obesity and the regulation of body mass

Lecture 34 (November 14): Obesity and type 2 diabetes, revision on Chapter 23

Lecture 35 (November 16): Exam revision

Lecture 36 (November 19): Exam III; Chapters 18, 19, 21

November 21-23: NO CLASS: THANKSGIVING HOLIDAY

Lecture 38 (November 26): Photosynthetic carbohydrate synthesis (Homework Chapter 23 due)

Lecture 39 (November 28): Photorespiration, biosynthesis of starch and sucrose

Lecture 40 (November 30): Oral Presentations (Alpine)

Lecture 41 (December 3): Oral Presentations (Midland), Synthesis of cell wall polysaccharides, revision on Chapter 20 (Homework Chapter 20 due)

Lecture 42 (December 5): Final Exam Revision

Final Exam (December 11): At 10:15 am-12:15 pm (Comprehensive)

Important Links:

SRSU Interlibrary loan:
https://library.sulross.edu/home/services/online-services/interlibrary-loan-document-delivery/

Download ChemDraw:
http://sitelicense.cambridgesoft.com/sitelicense.cfm?sid=3000

Register for SciFinder:
http://sulross.libguides.com/az.php?a=s

Access SciFinder:
https://scifinder.cas.org/scifinder/login
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 smart phone) 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.