Sul Ross State University  
Syllabus for Biochemistry II: BIOL 5307:003 (Fall 2018)

Class: Biochemistry II  
Room: WSB 321  
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 Outcomes (SLO):

The biology student graduating with a MS in Biology should be able to:

1. Understanding and implementation of scientific methodology.

2. Utilization of field techniques toward addressing scientific questions.

3. Be able to utilize statistics toward the analysis of data within the discipline.

4. Be able to effectively disseminate scientific findings using both written and oral communication.

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 15% 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 10%):

Presentations to the whole class will be on Friday 30th November.

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. Note: The chosen topic for the oral presentation will be different from that chosen for the research paper/poster assignments.

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.)
RESEARCH PAPER: DUE Friday 26th October 5:00 PM (worth 14%)

You are required to prepare a 15+ page paper (excluding bibliography) that summarizes your findings in the literature of a particular topic in the field of biochemistry (more details will be provided in class). Your bibliography should have > 20 peer-reviewed articles or citations that pertain to your topic of interest. Website citations WILL NOT be accepted. You will need to turn (email) in a copy (pdf) of the journal articles that you cite (or turn in hard copies of the journal articles cited).

Scoring rubric for research paper:

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.

RESEARCH POSTER: DUE Friday 16th November 5:00 PM (worth 10%)

Design a poster in PowerPoint that summarizes your findings from your research paper. You should have > 5 peer reviewed publications cited in your poster.

Scoring rubric for poster:

60%: Relevant biochemical literature/examples in poster, 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, etc.

20%: Format and design of your poster including the use of space, color, font size, quality of pictures/figures/tables etc. Format must include the following: title of your project, your name and institution, introduction and references. It’s your choice if
you want to include additional sections such as: the synthesis of drug X, biological evaluation of drug(s) X, discussion on the topic of interest, etc.

20%: References and figures must be properly cited per ACS standards (cited references MUST BE emailed to Dr. Leaver as .pdfs.). Grammar and correct use of scientific terminology.

PERCENTAGE BREAKDOWN OF MARKS:
Homework: 15%
Oral Research Presentation: 10%
Research Poster: 10%
Research Paper: 14%
Each Midterm Exam (12%): 36%
Final Exam: 15%

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.

Research Paper DUE 5:00 PM

Lecture 27 (October 29): Biosynthesis of fatty acids and eicosanoids and biosynthesis of triacyclglycerols (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; Research Poster DUE 5:00 PM
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): 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
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 handwritten 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.