

Biophysical chemistry, CHEM 5070, Fall 2021, 3 Credits

Professor Ryan Jackson

Section 1, T R, 9:00-10:15 AM, ESLC053

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Office Hours: I will hold a 1 hour office hour every Wednesday evening from 5:15 – 6:15 PM in ESCL 053 or 046. Come prepared to review lecture material, go over questions, and ask questions. If you have a specific need that you would like to discuss in person I am happy to schedule a one-on-one appointment.

Course Content/Objective: Chemistry 5070 examines how the physical and chemical properties of biological molecules (DNA, RNA, proteins, glycans, and lipids) determine their structure and function. Students will learn fundamental principles of physics and chemistry that explain how the complex reactions essential for life occur spontaneously. Chemistry 5070 solidifies biochemical principles covered in the 5700 series, while introducing novel concepts, methods, and applications of biophysical principles.

Idea objectives:

Obj 1: Gaining a basic understanding of the subject (e.g., factual knowledge, principles, generalizations, theories).

Obj 2: Learning to apply course material (to improve thinking, problem-solving, and decisions).

Obj3: Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course.

Obj4: Acquiring skills in working with others as a member of a team (Group Exams)

Textbook: The Molecules of Life - Physical and Chemical Principles by John Kuriyan, Boyana Konforti, David Wemmer

ISBN: 9780815341888

Price: E Books, Book Rentals, New and Used through USU Campus store (\$55-145). Online used and new (\$59-215)

Canvas: The lecture notes, exam keys, grade sheet, etc. for this course will be available through the course Canvas page. This site is found at canvas.usu.edu. Username = Banner ID; Password = Banner pin. Only students who are registered for the class will have access to the course Canvas page.

Exams: (650 pts) Four exams will be given during the course. Exams will have multiple-choice and fill in the blank questions, and this year will be given at the testing center, unless COVID restrictions cause us to move to proctorio. The first three exams will be worth 150 points, and the final 200 pts. Exam 1 will test on Chapters 6-11 (Thermodynamics); Exam 2 will test on Chapters 1-5, 12 & 13 and my own structure biology notes (Macromolecular Structures and Interactions); Exam 3 will test on Chapters 14-17 (Allostery and Kinetics); and the final exam will test on chapters 18 & 19 (100 pts) (Folding and Fidelity of DNA and Protein Synthesis) and the rest will be comprehensive (100 pts).

Group Exam Corrections: (150 pts) For the first three exams, 50 pts can be earned in the form of a group exam correction. Groups will be assigned the day the exam is handed back to the students. To earn the full 50 pts the following requirements must be met. 1. You must meet with your assigned group. Even if you missed nothing on the exam to earn these points you must participate. 2. All missed questions must be addressed in

your Exam Correction. 3. For each missed question the following needs to be addressed: why you missed the question, what is the correct answer, why is it the correct answer. Group exam corrections are meant to improve learning and build the team-working skills asked for in today's work environment.

Pre-quizzes: (50 pts) I will be assessing student knowledge before each section with 12 pre-quizzes to document learning. These quizzes should be taken **before attending** lecture. The quizzes will not be graded, but ~5 points per week will be earned through the completion of these assessments on time. 2 pre-quizzes can be missed and a student will still earn all available points.

Comprehension Quizzes: (50 pts) 12 quizzes will be assigned throughout the semester. The top 10 scores will be counted towards your grade.

Assignments: (100 pts) Four hands-on assignments will be given during the course (1 for each test unit). Assignment 1 will be 20 points, Assignment 2 will be 40 points, Assignment 3 will be worth 20 points, and Assignment 4 will be worth 20 points.

Grading: Grades will be based on a total of 1000 points. 800 points from exams, 100 points from class assignments, 50 points from Quizzes, and 50 points for pre-quizzes. At a minimum, the University Grading Scale will be used: A 100-93.00%, A- to 90.00%, B+ to 87.00%, B to 83.00%, B- to 80.00%, C+ to 77.00%, C to 73.00%, C- to 70.00%, D to 60.00%, F below 60.00%.

Missed Exams: Make-up exams are **only** allowed for students that can demonstrate a documented birth, death, illness, or presence at a scientific conference or professional interview. In the case of a scientific conference or interview please contact me **by email one week prior** so I can make arrangements for a make-up exam.

Late Assignments: No late assignments, quizzes, or exams will be accepted.

Assessment: Assessment of the course will include the University online IDEA evaluation conducted at the end of the course. Information from the evaluation will be used to improve the course. The primary IDEA objectives of Chem 5070 are to help students gain factual knowledge (terminology, classifications, methods, trends), and to learn to apply course material (improve critical thinking, problem-solving, and decisions).

Provisions: This course will adhere to the USU Academic Policies and Procedures Manual found at the web site <http://www.usu.edu/policies/> and in the student code <http://www.usu.edu/student-services/studentcode/>. Any student with a disability who requires accommodation must contact the instructor. The disability must be documented by the Disability Resource Center. Course materials may be requested in alternative formats.

Chemistry 5070, Fall 2019

Day	Date	Topic	Ch.	Quiz	Assignment
T	8/31	Energy and intermolecular forces	6		
R	9/2	Entropy	7	1 (5 pts)	
T	9/7	Linking Energy and Entropy: Boltzmann	8	2 (5 pts)	1 (20 pts)
R	9/9	Free Energy	9		Due 9/17
T	9/14	Chemical Potential	10		
R	9/16	Voltages and Free Energy	11	3 (5 pts)	

T	9/21	EXAM #1 Chapters 6-11		200 pts	
R	9/23	Central Dogma, Nucleic Acids	1-2		
T	9/28	Lipids and membranes	3	4 (5 pts)	
R	9/30	Protein Structure	4		2 (40 pts)
T	10/5	Evolutionary variation of proteins	5	5 (5 pts)	Due 10/18
R	10/7	Molecular Recognition	12		
T	10/12	"		6 (5 pts)	
R	10/14	Macromolecular specificity	13		
T	10/19	"			
R	10/21	EXAM #2 Chapters 1-5, 12, 13		200 pts	
T	10/26	Allostery	14	7 (5 pts)	
R	10/28	"			
T	11/2	Catalysis and Rates	15	8 (5 pts)	
R	11/4	"			3 (20 pts)
T	11/09	Enzyme mechanisms	16	9 (5 pts)	Due 11/19
R	11/11	"			
T	11/16	Diffusion and Transport	17	10 (5 pts)	
R	11/18				
T	11/23	EXAM #3 Chapters 14-17		200 pts	
R	11/25	NO CLASS THANKSGIVING			
T	11/30	Folding	18		
R	12/2	Folding	18	11 (5 pts)	4 (20 pts)
T	12/7	DNA and Protein Synthesis	19	12 (5 pts)	Due 12/9
R	12/09	"			
R	12/16	FINAL 9:30-11:20 am Chs. 18-19 (100 pts) and Comprehensive (100 pts)		200 pts	

Additional Course Policies:

COVID-19 Restrictions

In order to continue to provide various forms of face-to-face instruction at USU, and to limit the spread of COVID-19 during the pandemic, students are encouraged to follow certain classroom protocols during the fall 2020 semester. These guidelines are based on CDC, state, and local health department guidelines and in place not only for your safety but also the safety of the entire campus community.

- Face coverings are encouraged in all classrooms and teaching laboratories.
- Follow faculty instructions regarding social distancing and entering/exiting classrooms.
- Stay home when you are sick, however mild your symptoms.
- Wash your hands frequently with soap and water.
- Adhere to the seating chart

Withdrawal Policy and "I" Grade Policy

Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of "extenuating circumstances", but not due to poor performance or to retain financial aid. An incomplete (I) grade requires completion of a contract between the student and the instructor that describes the work remaining to complete the course. At the end of the term, the letter grade assigned under this circumstance is IX, where X is the letter grade assigned based on the total points accumulated. The student has 1 year to complete the missing work and to receive the revised letter grade. If the incomplete is not finished within one year, the letter grade assigned with the "I" becomes the grade for the course. The term "extenuating circumstances" includes:

- Incapacitating illness which prevents a student from attending classes for a minimum period of two weeks,
- A death in the immediate family,
- Financial responsibilities requiring a student to alter a work schedule to secure employment,
- Change in work schedule as required by an employer,
- Other emergencies deemed appropriate by the instructor. (<http://www.usu.edu/policies/pdf/Incomplete-Grade.pdf>)

Course Etiquette

Any successful learning experience requires mutual respect on the part of the student and the instructor. Neither instructor nor student should be subject to others' behavior that is rude, disruptive, intimidating, or demeaning. The instructor has primary responsibility for and control over classroom behavior and maintenance of academic integrity.

Instructor Responsibilities

- Treat all students with courtesy and respect.
- Be open to constructive input from students in the course.
- Ensure that opportunities to participate are shared equally by all students in the class.

Student Responsibilities

- Submit or complete class work on-time and be prepared for class activities.
- Refrain from packing up belongings before class ends.
- Turn off all electronic devices that might create a disruption in class.
- Be quiet and give full respectful attention while either instructor or fellow student is speaking.
- When speaking use courteous, respectful language and keep comments and questions relevant to the topic.

Syllabus Changes

This syllabus is subject to change. I will notify the class regarding all changes.

Course Fees

There are no course fees associated with this course.

University Policies:

Honor Pledge

As stated in The Student Code (<http://www.usu.edu/studentservices/studentcode/>), "Each student has the right and duty to pursue his or her academic experience free of dishonesty. The Honor System is designed to reinforce the higher level of conduct expected and required of all Utah State University students."

Upon admission to the university, you agreed to abide by this Honor Code by signing the Honor Pledge, which reads: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." Complete academic honesty is expected in this course. Cheating on exams or plagiarism on written assignments will result in a failing grade and may result in further action according to University policy.

Academic Dishonesty

The Instructor of this course will take appropriate actions in response to Academic Dishonesty, as defined the University's Student Code:

Acts of academic dishonesty include but are not limited to:

- Cheating using or attempting to use or providing others with any unauthorized assistance in taking quizzes, tests, examinations, or in any other academic exercise or activity, including working in a group when the instructor has designated that the quiz, test, examination, or any other academic exercise or activity be done "individually";
 - Depending on the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments;
 - Substituting for another student, or permitting another student to substitute for oneself, in taking an examination or preparing academic work;
 - Acquiring tests or other academic material belonging to a faculty member, staff member, or another student without express permission;
 - Continuing to write after time has been called on a quiz, test, examination, or any other academic exercise or activity;
 - Submitting substantially the same work for credit in more than one class, except with prior approval of the instructor; or engaging in any form of research fraud.
- Falsification: altering or fabricating any information or citation in an academic exercise or activity.
- Plagiarism: representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes using materials prepared by another person or by an agency engaged in the sale of term papers or other academic materials.

Full details for USU Academic Policies and Procedures can be found at:

- Student Conduct
- Student Code
- [Academic Integrity](#)
- USU Academic Policies and Procedures

Students with Disabilities

Students with ADA-documented physical, sensory, emotional or medical impairments may be eligible for reasonable accommodations. Veterans may also be eligible for services. All accommodations are coordinated

through the Disability Resource Center (DRC). Please contact the DRC prior to or as early in the semester as possible. Alternate formats for course content are available with advanced notice.

Contacting the Disability Resource Center (DRC):

- Location in Room 101 of the University Inn on-campus in Logan, Utah
- (435) 797-2444
- usu.edu/drc/

Disability Related Resources for Current Students

- DRC Student Handbook
- Deaf and Hard of Hearing Student Handbook
- Disability Related Scholarships
- Campus Resources
- Documentation Guidelines
- Online Resources for Students with Disabilities

Diversity Statement

Regardless of intent, careless or ill-informed remarks can be offensive and hurtful to others and detract from the learning climate. If you feel uncomfortable in a classroom due to offensive language or actions by an instructor or student(s) regarding ethnicity, gender, or sexual orientation, contact

- James Morales, Vice President of Student Services (435) 797- 1712; morales@usu.edu
- You can learn about your student rights by visiting: <http://www.usu.edu/student-services/studentcode>

Grievance Process

Students who feel they have been unfairly treated may file a grievance through the channels and procedures described in the Student Code: <http://www.usu.edu/student-services/studentcode/>