

Chemistry 4360/5383: Advanced Biochemistry and Molecular Biology
Fall 2014

Monday and Wednesday 12:30-1:50pm, HINE 202

Instructor:

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Office Hours: Tuesday 8:30-10:30am

Thursday 2-4 pm

If you are unable to attend office hours, contact me to make an appointment.

Course Description: This course provides Biochemistry majors and minors with advanced knowledge of the field of molecular biochemistry. Topics include gene expression (transcription and translation of genes in bacteria and higher organisms), post-translational modification of proteins, chromosomal DNA replication, cell cycle checkpoint controls, DNA damage and repair, as well as theories of cancer and aging.

Prerequisites: CHEM3375 with a minimum grade of D. Advanced Biochemistry builds on the material covered in CHEM3375. Therefore, keep in mind that if you have not mastered this material, you begin this course at a disadvantage.

Course Format: This course will use a variety of different formats to address various learning styles. Students are expected to be active participants in their learning by reading the assigned material, engaging in the material presented, and participating in classroom activities.

Assigned reading material: Because of the considerable amount of material covered in this course, students will be expected to read the material assigned before class so that we can discuss the more challenging aspects of the topic.

Student Presentations: Part of learning to be a good scientist is learning to communicate with the larger scientific community. Therefore, some material will be taught through student presentations. This information is as important as other material covered in class.

Course Objectives:

After completion of this course, the student should be able to:

- Develop a working vocabulary of biochemical and molecular biology terms (*i.e.*, give a definition, use terms in context, and apply the term in a new context).
- Identify and explain the biochemical structure of nucleic acids.
- List and explain the various functions of nucleic acids.
- Predict and explain the behavior of biomolecules and biochemical systems by applying chemical principles to these systems.
- Describe the current understanding of the molecular biology processes of DNA replication, DNA repair, gene expression and regulation, and protein synthesis.
- Explain and interpret data generated from application of modern and historical molecular biology techniques.

- Interpret experimental data and relate the interpretation to the current knowledge of molecular biology processes including replication, transcription, etc.
- Solve problems involving nucleic acids and utilizing molecular biology techniques.
- Perform bioinformatic analysis of genomes and specific genes.
- Read and interpret a scientific research article and be able to articulate its contents in both written and oral formats.
- Work cooperatively in teams to identify a problem, formulate a plan, and accomplish a task.
- Assess the quality of presentations by others and oneself.

Course Grades and Assessment:

Grading: The course will include assignments/quizzes/Clickers responses (25 possible points), minireview paper assignment and poster presentation (150 possible points), three Exams (300 possible points), and a comprehensive Final Exam (150 possible points). Only whole points may be earned.

The total points needed for a particular grade are listed below.

A = 562-625 pts

B = 500-561 pts

C = 437-499 pts

D = 375-436 pts

A total less than or equal to 374 will result in a final grade of F.

The instructor reserves the right to adjust grading depending on student performance. Any changes to the above policy will be announced in class and on TRACS.

Assignments/Quizzes:

Quizzes: In-class quizzes for points, including unannounced quizzes, will be periodically used to assess student knowledge.

Assignments: In-class and take-home assignments related to current course topics will be given, including scientific reading and writing assignments as well as oral presentations.

Exams: The exams will contain a combination of multiple-choice questions, problems, short answers and/or essays. Exams are based on the lectures, textbook reading assignments, and the suggested problems.

Three exams of 100 points each are scheduled during the semester, and a final cumulative exam of 150 pts will be administered at the end of the semester. While all exams are effectively cumulative because each topic depends on the previous material, Exams 1-3 will emphasize the information discussed since the previous exam. The final exam will be fully cumulative.

Exam	Possible Points	Dates
1	100	Monday, September 29 th
2	100	Wednesday, October 22 nd
3	100	Wednesday, November 12 th
Final	150	Wednesday, December 10 th at 11 am

Exam Policies: Exams will begin 5 minutes after the scheduled class start time (12:35 pm) and end at the scheduled class end time (1:50 pm). No student will be allowed additional time without documented need by the Office of Disability Services.

Exams are carefully and consistently graded. If you feel that a question was graded incorrectly or if you disagree with an answer, you must return it **no sooner than 48 hours and no later than two weeks** with a clear, written explanation of why you should receive additional points as well as evidence for the correct answer. At that time, the entire exam may be re-graded, resulting in gain or loss of points on other questions not being contested. All exam corrections must be petitioned for in writing within the window above.

In the event of a fire alarm or other emergency during an exam, please leave your exams with the instructor. If safety permits, remain within the vicinity of the classroom and return to when allowed. The instructor will assess whether there is sufficient time to complete the exam.

Extra credit: There will be bonus points built into each exam (*i.e.* 105 possible points/100 graded points). No individualized extra assignments will be given.

Resources:

Textbooks: The required textbook for the class is Molecular Biology of the Gene, 7th Edition, by Watson, Baker, Bell, Gann, Levine and Losick (CSHL Press, 2014).

Note that reading the same material in a couple of different ways can often help to solidify an understanding of the material. Additional biochemistry textbooks are available in the library.

Scientific Journals: Biochemistry and molecular biology are constantly growing fields that change from day to day. Therefore, textbooks are often out of date by the time they reach press. The best and most recent information is found in scientific journals. Review articles found in most journals are a great way to summarize the current understanding on a topic. The following list are a few of the journals carried in our library (starred journals are exclusively collections of review articles):

Biochemistry	Trends in Biochemical Sciences *
Nature	Annual Reviews of Biochemistry*
Science	Journal of Biological Chemistry
Cell	Journal of Molecular Biology
Molecular Cell	Nucleic Acids Research
Nature Structure Molecular Biology	

Attendance Policy: *You are expected to attend every class.* Attendance is important to fully understand the material. There will be material covered in class that is not in your reading and which will be on quizzes and exams.

Exams: Make-up exams will not be given; exams must be taken on the scheduled day. If a student arrives late to class, they will have the remainder of the class period to complete the exam. If a student misses an exam, the final exam grade will substitute for the missed exam. Any second missed exam will be given a zero.

Quizzes: Quizzes, including unannounced ones, will be given in class. Make-up quizzes will not be given. If a student misses a quiz, the grade for that quiz will be a zero.

Clickers: Clickers are being provided to you free of charge. Check out a Clicker on the first day of class if you do not already have one. The Clicker is your responsibility. If you lose it, you will be charged \$65 for their replacement. Clickers will be used on a regular basis to informally monitor attendance and assess student understanding of key concepts. A maximum of 5% of the course grade (*i.e.*, ≤ 30 points) will be from Clicker participation.

TRACS: A TRACS site will be used extensively during this course for both resources and assignments. Please refer to it frequently. You must have a valid Texas State University username and password.

Email questions to instructor: You are welcome to email questions to the instructor. If the email is relevant to the entire class, the instructor's response will be posted on TRACS in the "Fall 2014 e-mail responses" folder in a manner that anonymizes the original query.

Academic Integrity: The University Honor Code "require[s] all members of this community to be conscientious, respectful, and honest":

<http://www.txstate.edu/effective/upps/upps-07-10-01-att1.html>

More broadly, the practice of science is founded upon principles of honesty, trust, accountability, and respect. Without such a foundation, the entire enterprise would crumble. Therefore, the Honor Code is strictly enforced in this course, and any violations will be pursued.

As a reminder of the critical role of academic integrity, you are expected to include the students' pledge on all written assignments:

"I pledge to uphold the principles of honesty and responsibility at our university."

All assignments are to be completed individually, unless you are explicitly instructed to work in groups. ***Violation of the honor code will result in an automatic course letter grade decrease.*** Additional consequences for violations are at the instructor's discretion.

Drop Policy: Students may drop this course and receive a "W" at anytime prior to the official university deadline on Thursday, October 23rd at 5:00pm. Students may withdraw from the university (*i.e.*, drop all courses) by Thursday, November 20th.

Special Needs Information: Students with special needs as documented by the Office of Disability Services should identify themselves at the beginning of the semester in order for accommodation to be made.

COURSE OUTLINE:

Class #	Date	Topic	Corresponding Chapter* Assignment Due Dates
1	25-Aug	Syllabus, Assessment	
2	27-Aug	Review <i>Timeline Assignment distributed</i>	Chapter 1-6
	1-Sep	no class - Labor Day	
	2-Sep		<i>Timeline Slides Due</i>
3	3-Sep	Timeline Presentations	
4	8-Sep	Molecular Biology Techniques	Chapter 7
5	10-Sep	Molecular Biology Techniques	
6	15-Sep	Chromatin & Genome Structure	Chapter 8
7	17-Sep	Chromatin & Genome Structure	
8	22-Sep	DNA Replication	Chapter 9
9	24-Sep	DNA Replication	
10	29-Sep	EXAM I	
11	1-Oct	DNA Repair	Chapter 10
12	6-Oct	DNA Recombination	Chapter 11/12
13	8-Oct	DNA Recombination	
14	13-Oct	Transcription	Chapter 13
15	15-Oct	Transcription	<i>Paper Topic Due</i>
16	20-Oct	RNA Processing	Chapter 14
17	22-Oct	EXAM II	
18	27-Oct	Translation	Chapter 15/16
19	29-Oct	Translation	
20	3-Nov	Gene Regulation	Chapter 18/19 <i>Abstract Due</i>
21	5-Nov	Gene Regulation	Chapter 19/20
22	10-Nov	Gene Regulation	
23	12-Nov	Exam III	
24	17-Nov	Poster Presentations	<i>Paper and Poster Presentations Due</i>
25	19-Nov	Poster Presentations	
26	24-Nov	Poster Presentations	
	26-Nov	no class - Thanksgiving Break	
27	1-Dec	Special Topics: Origin of Life	Chapter 17
28	3-Dec	Review	
	10-Dec 11 am	COMPREHENSIVE FINAL EXAM	

* Additional reading will be assigned through the semester. These are the corresponding chapters in the textbook. Note that the above topics, schedule, and exam content are subject to change as needed. Students will be notified *in class* of any changes.