

CHEM 4360: Molecular Biology

Fall 2021

Tuesday and Thursday 8:00 am – 9:20 am

Face-to-Face

CHEM 105

revised 8Sept2021, office hours & article selection deadline

Instructor:

Dr. Karen A. Lewis

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Office Hours: Mon, Fri 10 – 11 am, Wed 9 – 10:30, and by appointment

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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: CHEM 3375 or CHEM 4375 with a minimum grade of D. Advanced Biochemistry builds directly on the material covered in CHEM 3375/4375. If you have not mastered that material, you begin this course at a significant disadvantage.

Course Format: This course will be administered as synchronous, in-person class, using the “flipped” classroom format. **Set your alarms for Tues/Thurs mornings!** Pre-class lectures will be presented via Canvas, and class meetings will be held synchronously in person.

Multiple instructional formats will be used to accommodate different 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: Students are expected to read the material assigned before class in preparation for a focused discussion of the more challenging aspects of the topic.

Pre-class lectures: Students are expected to fully view the pre-class lectures posted on Canvas before each synchronous class meeting. For some material, brief quizzes will review the lecture material and will be due before class; for other material, in-class activities will draw directly on lecture material and be due at the end of the synchronous class meeting that follows the pre-class lecture.

Problem sets: The primary activity in the synchronous class meetings will be detailed problem sets that review and apply the material presented in the online pre-class lectures. These problem sets will be graded for both completion and correctness.

Student presentations: Some material will be taught through student presentations. This information is as important as other material presented by the textbook, lecture, or problem sets, and will be included in graded assessments.

Course Objectives

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

- Employ 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 structure of nucleic acids.
- List and explain the cellular 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 produced from a variety of molecular biology techniques.
- Interpret experimental data and relate their interpretation to the current understanding of molecular biology processes.
- Solve problems involving nucleic acids by utilizing molecular biology techniques.
- 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, create a plan, and complete a task.
- Assess the quality of presentations by others and oneself.

Course Grades and Assessment

With the “flipped classroom” format, this course uses a variety of assignments and activities for student learning and assessment. The overall scheme for grading the course assignments is detailed below.

Letter grades are assigned as percentage of points earned:

A	≥ 89.5%
B	79.5 – 89.49%
C	69.5 – 79.49%
D	59.5 – 69.49%
F	≤ 59.49%

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

	Number	Points Each	Total Points	Final Points	
Problem Sets	7	25	140	120	<i>drop lowest 1 drop lowest 2</i>
Weekly Quizzes	12	10	120	100	
Exams	4	75	300	300	
Literature critique					
<i>selections</i>	1	10	10		
<i>outline</i>	1	20	20		
<i>peer eval outline</i>	2	15	20		
<i>poster/pres</i>	1	50	50		
<i>peer eval presentation</i>	2	15	20	120	
<i>paper</i>	1	100	100	100	
Final Exam	1	150	150	150	
SEMESTER TOTAL:				920	

Quizzes: Regular quizzes will be administered to assess student comprehension of the pre-class recorded lecture material. There are no make-up quizzes. At the end of the semester, the lowest two (2) quiz grades will be dropped.

Problem Sets: In-class problem sets will be used regularly to introduce, explore, comprehend, analyze, and apply course material. Students may complete problem sets either electronically (*i.e.*, annotate a PDF) or as a hard copy (*i.e.*, print out, complete by hand). To submit completed problem sets for grading and assessment, students must submit a PDF copy (annotated PDF or a scanned version of the paper copy, using Adobe Scan or similar). *If this presents a technological challenge to you, alternative arrangements are possible; please talk with Dr. Lewis during the first week of the semester.* Late assignments will not be accepted. At the end of the semester, the lowest problem set grade will be dropped.

Concept Maps: Problem sets will be interspersed with small-group concept map activities. Please sign up for a FREE account with padlet.com.

Our class überpadlet will be located here – add it to your Padlet to get started!

<https://padlet.com/XXXXXX>

Dr. Lewis will set each small group up with individual Padlets for each concept module, so that small groups can work together. More details about the Padlet environment and structure will be discussed in class. You do not need to pay for an upgraded Padlet account. The free version is sufficient!

Exams: Exams will be administered in class. The exams will draw on material covered by Canvas lectures, synchronous class activities, textbook reading, suggested problems, problem sets, student presentations, and other assignments. While all exams are effectively cumulative, the semester exams will emphasize topics covered since the previous exam. The final exam is cumulative.

Exam	Possible Points	Dates
1	75	Sept 16
2	75	Oct 6
3	75	Oct 28
4	75	Nov 11
Final	150	Dec 9

No student will be allowed additional time without documented need by the Office of Disability Services. Please approach Dr. Lewis as early in the semester as possible to arrange ODS accommodations.

All effort is made to grade exams carefully and consistently. You may petition for corrections to an exam grade. Any exam corrections must be petitioned for in writing no sooner than 48 hours and no later than two weeks after the graded exams have been returned. The petition must contain a clear, written explanation of why you should receive additional points as well as evidence for the correct answer. Dr. Lewis may choose to re-grade the answer in question or the entire exam, resulting in gain or loss of points on other questions not being contested. **Grade corrections outside the above window will not be considered.**

If you encounter an emergency during an exam, please contact Dr. Lewis as soon as is reasonable for your health and safety. Dr. Lewis will determine whether there is sufficient time to complete the exam and what, if any, accommodations can be made.

Extra Credit: Bonus points are built into each exam (e.g. 80 possible points/75 graded points). No individualized extra assignments will be given.

Exam Grade Replacement: At the end of the semester, students will be given the option to replace their lowest exam score with their final exam score (scaled to 75 points). Note that this is strictly an opt-in policy; the lowest exam grade will not automatically be replaced.

Resources

Textbooks: The required textbook for the class is Molecular Biology: Principles and Practice, by Cox, Doudna, and O'Donnell (W.H. Freeman). Either the 1st edition (2012) or the 2nd edition (2015) is suitable; when there are critical differences, Dr. Lewis will note it in class. A copy of the 2nd edition is on reserve in Alkek Library.

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; books that may be particularly helpful are Molecular Biology of the Gene, by Watson *et al.*, Biochemistry by Voet & Voet, and Fundamentals of Biochemistry by Voet, Voet, & Pratt.

Scientific Journals: Biochemistry and molecular biology are constantly growing fields that change rapidly. Therefore, textbooks may be 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 summary of the current understanding on a topic. Some relevant journals carried in our library are:

<i>Biochemistry</i>	<i>Nature Structural & Molecular Biology</i>
<i>Nature</i>	<i>Annual Reviews of Biochemistry</i>
<i>Science</i>	<i>Journal of Biological Chemistry</i>
<i>Cell</i>	<i>Journal of Molecular Biology</i>
<i>Molecular Cell</i>	<i>Nucleic Acids Research</i>

Attendance Policy: While attendance is not taken, ***you are expected to attend every class.*** Attendance is important to fully understand the material; merely reading the textbook and watching the pre-class lectures on Canvas will be insufficient. In particular, the in-class problem sets that are part of the flipped classroom will cover material that is not presented in the text or online lectures, and which will be subject to summative graded assessments like quizzes and exams. Because attendance is not taken, there are no excused absences.

Exams: Make-up exams will not be given. If a student begins an late in the exam period, they will have the remainder of the exam period to complete the exam. If a student misses an exam, they may elect to replace that zero with the final exam grade as described above (“Exam Grade Replacement”). Any second missed exam will be given a zero.

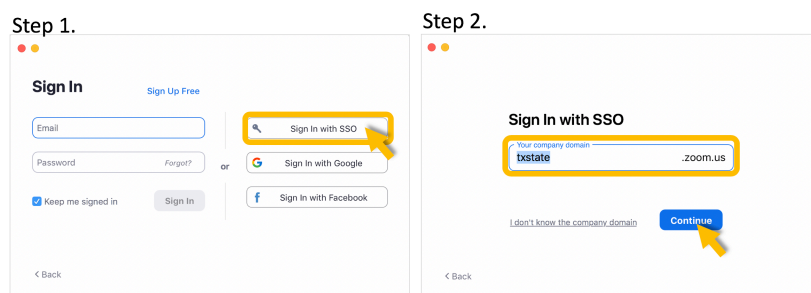
Quizzes: Make-up quizzes will not be given. If a student misses a quiz (whether announced or unannounced), the grade for that quiz will be a zero. At the end of the semester, the lowest two quiz grades will be dropped.

Canvas: A course Canvas site will be used extensively during this course for both resources and assignments. Pre-class lectures will be posted here, and you are expected to log in regularly. You must have a valid Texas State University NetID and password.

Please note that the Canvas gradebook will be an accurate record of individual grade items, but what Canvas shows for the course average may not be accurate. Dr. Lewis’ standard

practice for any LMS gradebook is to maintain a separate Excel spreadsheet, which is used to calculate end-of-semester course grades. The weights, drops and substitutions for different categories of grades are outlined below in this syllabus and will be followed in calculating your course grade. Dr. Lewis strongly recommends that each student similarly records and tracks their own individual assignment grades in a spreadsheet, as well as retain copies of all graded work for the semester.

Zoom: Office hours will be administered via both Zoom and face-to-face in Dr. Lewis' office. You must log in to Zoom using your Texas State University NetID and password, using the "SSO login" mechanism.



Please be sure to routinely check your displayed name and profile picture. They need to be professional and appropriate for an educational setting. To alter either your displayed name or your profile picture, you may adjust the "participant settings" in Zoom. A detailed protocol on how to do that will be posted to the course Canvas site.

Additional information about the professional use of Zoom is detailed below.

Email questions to instructor: You are welcome to email questions to Dr. Lewis. If the email is relevant to the entire class, the response will be anonymized and posted to Canvas discussion boards. You can check this discussion board before emailing, to see if someone else had the same question. (Insider tip: if you have a question about something, it's very likely that someone else is also wondering about it, too!)

Professionalism and Respect: Both the University and Dr. Lewis are committed to an educational community in which each individual is respected, appreciated, and valued. Class rosters are provided with the student's legal name. All requests to address you by an alternate name, pronunciation, and/or gender pronoun will be honored. Please advise Dr. Lewis (in person, via a Zoom meeting, or by email) of this preference early in the semester.

Active Participation: During class meetings, it will be very important to create the opportunity for everyone to actively and meaningfully participate in whole-class discussions and small group work.

Audio/Visual Professionalism: Per University policy, students are expected to dress and act appropriately and professionally for all video and synchronous sessions. This includes creating videos for classes and participating in real-time video conferences or exams. It is expected that the video be turned on and you be in a private setting. Please do not plan to join Zoom meetings while you are driving or not in a confidential environment, to respect your privacy and ensure your safety. It is also recommended that you use headphones with a microphone to minimize audio interference.

Your display name should be professional, and you are encouraged to also have an appropriate picture as your Zoom profile picture. (Insider tip: “appropriate” does not equal a fancy professionally-photographed headshot, so don’t stress over that! However, do avoid extremely casual pictures – such as those that may include red plastic cups, swimwear, *etc.*)

If your circumstances are such that the video feed is *at all* difficult (*e.g.*, unstable internet connection, personal physical surroundings, *etc.*), please know that you are not required to activate your video feed. You may fully participate in office hours via audio and/or the Zoom chat function; if you have specific concerns, please do not hesitate to discuss them with Dr. Lewis. There are almost always solutions!

Netiquette: Texas State policy (PPS 4.02) states that disruptive behaviors will not be tolerated in any type of learning environment. Examples of such behaviors include but are not limited to: making loud noises, speaking without recognition, making personal threats or insults, eating or drinking in classrooms, sleeping during class, using electronic equipment prohibited by the instructor or disrespectful of other students, using inappropriate or vulgar language, or taking other actions that others might find offensive, demeaning, or disrespectful.

Any violations of this policy will be dealt with according to TXST policy [UPPS No. 07.10.05, Student Behavior Assessment Team](#). For further guidance, please see [AA/PPS No. 02.03.02 \(4.02\)](#) and [Section 2.02 of Texas State’s Code of Student Conduct](#).

Academic Integrity: Collaborative learning presents a unique set of concerns and issues about academic integrity. Be advised that any compromise or violation of academic integrity will not be tolerated in this course. **This includes the sharing of any course material on third-party collaborative and/or “tutoring” sites (e.g., Chegg, Reddit, social media, etc).**

The [University Honor Code](#) “require[s] all members of this community to be conscientious, respectful, and honest.

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 submitted assignments:

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

Some assignments (in particular, the problem sets and concept maps) are intended to be collaborative. All other assignments, including quizzes, exams, and the literature critique, are to be completed individually, unless you are explicitly otherwise instructed. ***Violation of the honor code will result in academic penalties at the instructor’s discretion, up to and including failure in the course.***

Drop Policy: Students may drop this course and receive a "W" at any time prior to October 25 at 11:59 pm. Students may fully withdraw from the university by November 18 at 11:59 pm.

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.

Sexual Misconduct Reporting (SB 212): Effective January 2, 2020, state law (SB 212) requires all university employees, acting in the course and scope of employment, who witness or receive information concerning an incident of sexual misconduct involving an enrolled student or employee to report all relevant information known about the incident to the university's Title IX Coordinator or Deputy Title IX coordinator. According to SB 212, employees who knowingly fail to report or knowingly file a false report shall be terminated in accordance with university policy and The Texas State University System Rules and Regulations.

Emergency Management: In the event of an emergency, students, faculty, and staff should monitor the [Safety and Emergency Communications web page](#). This page will be updated with the latest information available to the university, in addition to providing links to information concerning safety resources and emergency procedures. Faculty, staff, and students are encouraged to sign up for the [TXState Alert](#) system.

COVID-19 Contingency Plans: The continuing global pandemic caused by SARS-CoV-2 requires that we make plans and prepare institute contingency plans for if/when either the instructor or a student falls ill.

Considering rising infection rates and recent [Centers for Disease Control and Prevention guidelines](#), Texas State is requesting all members of the university community to take these five additional steps:

1. **Get tested.** Regardless of vaccination status, get tested before the start of the fall semester and when selected to participate in Texas State's random COVID-19 testing program. Testing information can be found on the [Texas State's COVID-19 Testing, Reporting, and Response Steps webpage](#).
2. **Stay home and get tested if you develop cold-like or other [COVID-19 symptoms](#),** regardless of vaccination status.
3. **Promptly Report to Bobcat Trace** if you test positive for COVID-19 or have had close contact with someone who received a positive test result. Reporting information can be found on the [Texas State's COVID-19 Testing, Reporting, and Response Steps webpage](#).
4. **Isolate if you test positive for COVID-19.** Stay home and away from others for 10 days from the start of symptoms or the positive test if you have no symptoms.
5. **Quarantine if you have been identified as a close contact** and stay home for the prescribed time period.
 - Fully vaccinated Bobcats who are asymptomatic are not required to quarantine but should get tested for COVID-19 three to five days after last exposure. They should also wear a face mask when indoors in public spaces for 14 days since the exposure or until a negative test result is obtained three to five days after exposure.
 - Unvaccinated Bobcats are required to quarantine for 10 days since the time of last exposure.

It is vital that we all follow the [Bobcat Pledge](#), including the shared responsibility to practice healthy behaviors and follow the health and safety guidelines, which shows respect for others and helps prevent the spread of COVID-19 on campus and in the surrounding community.

Specific plans for CHEM 4360: Molecular Biology:

Instructor gets sick: The core materials for CHEM 4360 (pre-class lectures and in-class problem sets) will be prepared well ahead of time to buffer any potential delays due to instructor illness. If Dr. Lewis falls ill, she will self-isolate and find a substitute instructor who will facilitate the in-person class, while Dr. Lewis joins via Zoom. Through these efforts, students will be able to continue to work through problem sets and concept maps. In particular, she will continue to host office hours as scheduled.

If Dr. Lewis' symptoms interfere with her ability to host either the synchronous class meetings or office hours, a substitute faculty will take her place both as the in-class problem set guide, and provide substitute office hours until Dr. Lewis recovers. The Department of Chemistry and Biochemistry has built a strong system of backup instructors for all courses, and CHEM 4360 has an especially deep bench from which to pull a substitute! The identity of the substitute faculty will depend on when in the semester they are needed, and their own course and personal commitments. (Insider scoop: many of us faculty are backup for multiple courses, and so if multiple faculty or their families fall ill simultaneously, our department is in a highly adaptable position to distribute substitute assignments.) **Take-home message: class will keep going even if Dr. Lewis gets sick.**

Student gets sick: All students should follow the [10 Guiding Principles for Health, Safety, and Wellness](#) at Texas State. **Students are strongly encouraged to a [cloth face covering](#), regardless of vaccination status**, and are advised to perform a [self-assessment](#) each day before coming to campus. If you are sick, **do not go to school or work**. If you have COVID-19 symptoms, contact your healthcare provider or the [Student Health Center](#) (512-245-2161) for evaluation and testing for COVID-19. The [Student Roadmap](#) contains valuable information regarding safe practices and procedure for a successful Fall Semester on our campus. If any illness impacts your ability to participate in this course, contact the [Dean of Students Office](#) with appropriate documentation.

Take-home message: in most cases, the existing learning opportunities and grading policies for CHEM 4360 are sufficient to handle an illness, including COVID-19, without any additional adjustment. In extraordinary circumstances, as determined by Dr. Lewis, documentation through the Dean of Students Office will be required before any special allowance can be considered.

COURSE OUTLINE:

Class #	Date	Topic	Chapter*	Pre-Class Assignment	In-Class	Post-Class Assignment
1	24-Aug	Introduction	1			
2	26-Aug	Genes to Proteomes	6, 7, 8	Canvas Lecture	Mini-Lecture Problem Set 0: Genes to Proteomes	
3	31-Aug	Chromatin & Genome Structure	9, 10	Canvas Lecture <i>Canvas Quiz</i>	Concept Map 1 Problem Set 1	<i>Problem Set 0</i>
4	2-Sep	Chromatin & Genome Structure	9, 10	Canvas Lecture <i>Canvas Quiz</i>	Problem Set 1 cont'd	
5	7-Sep	DNA Replication <i>Lasker Award</i>	11	Canvas Lecture	Concept Map 2 Problem Set 2	<i>Problem Set 1</i>
6	9-Sep	DNA Replication		Canvas Lecture <i>Canvas Quiz</i>	Problem Set 2 cont'd	
7	14-Sep	DNA Replication		Canvas Lecture	Problem Set 2 cont'd	<i>Problem Set 2</i>
8	16-Sep	Exam I			Exam I	<i>Article Selections Due</i>
9	21-Sep	DNA Mutation and Repair	12	Canvas Lecture <i>Canvas Quiz</i>	Concept Map 3 Problem Set 3	
10	23-Sep	DNA Mutation and Repair	12	Canvas Lecture	Problem Set 3 cont'd	<i>Problem Set 3</i>
11	28-Sept	DNA Recombination <i>Nobel Prize in Physiology or Medicine</i>	13, 14	Canvas Lecture <i>Canvas Quiz</i>	Concept Map 4 Problem Set 4	
12	30-Sept	DNA Recombination <i>Nobel Prize in Chemistry</i>		Canvas Lecture <i>Canvas Quiz</i>	Problem Set 4	<i>Problem Set 4</i>
13	5-Oct	Literature Critique: Outlines		<i>Outlines Due</i>	Critique Outline Peer Review	
14	7-Oct	Exam II			Exam II	
15	12-Oct	Transcription	15	Canvas Lecture <i>Canvas Quiz</i>	Concept Map 5 Problem Set 5	

16	14-Oct	Transcription		Canvas Lecture	Problem Set 5 cont'd	<i>Problem Set 5</i>
17	19-Oct	RNA Processing	16	Canvas Lecture <i>Canvas Quiz</i>	Concept Map 6 Problem Set 6	
18	21-Oct	RNA Processing		Canvas Lecture <i>Canvas Quiz</i>	Problem Set 6 cont'd	
19	26-Oct	Transcription & RNA Processing			Revisit Concept Maps 5 & 6	<i>Problem Set 6</i>
20	28-Oct	Exam III			Exam III	
21	2-Nov	Translation <i>Breakthrough Prize</i>	17, 18	Canvas Lecture <i>Canvas Quiz</i>	Concept Map 7 Problem Set 7	
22	4-Nov	Translation		Canvas Lecture <i>Canvas Quiz</i>	Problem Set 7 cont'd	
23	9-Nov	Translation		Canvas Lecture	Problem Set 7 cont'd	<i>Problem Set 7</i>
24	11-Nov	Lit Critique Posters			Posters Workshop	
25	17-Nov	Exam IV			Exam IV	
26	19-Nov	Lit Critique Posters		<i>Presentations Due</i>	Lit Critique	
27	23-Nov	Lit Critique Posters			Lit Critique	<i>Presentation Peer Reviews Due</i>
	25-Nov	<i>no class - Thanksgiving Break</i>				
28	30-Nov	Regulation of Gene Expression	19, 20	Canvas Lecture <i>Canvas Quiz</i>	Problem Set 8: Reg'n of Gene Expr'n	
29	2-Dec	Regulation of Gene Expression	21, 22	Canvas Lecture	Problem Set 8 cont'd	<i>Literature Critique Paper Due</i>
FINAL EXAM Thurs 9-Dec, 8:00 am - 10:30 am						

* Listed are the corresponding chapters in the textbook. Additional reading may be assigned during the semester as appropriate for the topic being discussed. Note that the above topics, schedule, and exam content are subject to change as needed. Students will be notified *in class* of any changes.