

Towson University
Biochemistry Laboratory – CHEM 356
Syllabus – Spring 2021

Class Time & Location

Wednesdays from 12:00 noon to 6:00 pm
Experimental Laboratory: Smith Hall, Room 572
Online Platform: Zoom

Instructor

Ana Maria Soto
Office: Science Complex, Room 5301C
Email: asoto@towson.edu
Phone: 410-704-2605 (email is preferred since I will not be in my office most days)
Office Hours: Monday 4 to 6 pm (please contact me by email for a zoom link)

Course Objectives & Prerequisites

This course is designed to teach basic techniques utilized in a biochemistry laboratory. The objectives of this course are to (i) learn and perform basic biochemical techniques; and (ii) apply fundamental biochemical principles to analyze experimental data and interpret results. At the end of the course the students should have developed sufficient background to conduct basic biochemical experiments independently. Pre- or Co-requisite: CHEM 351

Required Materials

- Safety Glasses (Goggles)
- Laboratory Notebook (any bound notebook)
- Calculator
- Computer equipped with Zoom, Excel and Word and with the availability to download Pymol and non-linear fitting software (e.g. Origin or Curve Expert).

Blackboard & Email

Several course materials will be posted on Blackboard. I will contact you by e-mail whenever there is a change in the tentative course schedule or any new material is posted in Blackboard. Please check your Towson e-mail account frequently as some of this information may be critical for the course.

Useful Textbooks and Articles

- Johnson Jr, J., Reyes, F., Polaski, J. et al. B12 cofactors directly stabilize an mRNA regulatory switch. *Nature* 492, 133–137 (2012). <https://doi.org/10.1038/nature11607>
<https://www.nature.com/articles/nature11607>
- Warner, D.F., Savvi, S., Mizrahi, V., Dawes, S.S. A riboswitch regulates expression of the coenzyme B12-independent methionine synthase in *Mycobacterium tuberculosis*: implications for differential methionine synthase function in strains H37Rv and CDC1551. *J. Bacteriol.* 2007, 189, 3655-3659. doi:10.1128/JB.00040-07
<https://jb.asm.org/content/189/9/3655.long>
- Vitreschak, A.G., Rodionov, D.A., Mironov, A.A., Gelfand MS. Regulation of the vitamin B12 metabolism and transport in bacteria by a conserved RNA structural element *RNA* **2003**, 9, 1084-97 doi:10.1261/rna.5710303
<https://rnajournal.cshlp.org/content/9/9/1084.full>
- Schwenk, S., Arnvig, K.B. Regulatory RNA in *Mycobacterium tuberculosis*, back to basics. *Pathog Dis.* **2018**, 76, 10.1093/femspd/fty035. doi:10.1093/femspd/fty035
<https://academic.oup.com/femspd/article/76/4/fty035/4966984>
- Lehninger Principles of Biochemistry, 2021, David L. Nelson and Michael M. Cox. Eight Edition. Publisher: W.H. Freeman
- Biochemistry, 2010, Donald Voet & Judith Voet. Fourth Edition. Publisher: John Wiley & Sons, Inc.

Syllabus Changes

Circumstances may change due to the current novel coronavirus (COVID-19) outbreak. Thus, our syllabus may need to be revised to accommodate sudden changes in class format or missed laboratory periods.

Some Towson University Resources:

- Parking: If you do not have a parking permit this semester, you can purchase a daily parking permit. The daily permits are purchased through the ParkMobile App and are 50% off of usual daily visitor rates.
<https://www.towson.edu/parking/>
<https://www.towson.edu/parking/documents/spring2021-dailypermitsinstructions-2.pdf>
- Library: The Cook Library is open with some safety restrictions:
<https://libraries.towson.edu/featured/what-expect-when-you-visit-cook-person>
- Glen Dining Hall Quiet Study Space with Wi-Fi
<https://www.towson.edu/news/2020/glen-dining-study-area.html>
- Some students may be eligible to borrow a computer for a short- or long-term loan. Here are some instructions to determine eligibility
 1. Student should apply for CARES Act funds to purchase their own computer
<https://www.towson.edu/studentaffairs/care/student-emergency-fund.html>
 2. While the application is being review, students should check this information on the minimum recommended specs to purchase their own computer
<https://www.towson.edu/technology/facultystaff/hardwaresoftware/computer.html>
 3. Receiving funds can take a couple weeks. If a student needs a computer in the meantime, they can contact SCS* (Student Computing Services) for a short-term loan.
 4. Should that emergency funds process not end favorably, the student can then contact SCS* for a longer term loan
 5. *SCS contact information:
<https://www.towson.edu/scs> (there is a chat option in the lower right)
 Text Messaging: 410-324-7271
 Phone: 410-704-5151 (select option 1 for student request)
 Email: scs@towson.edu

Grading Policies:

The final grade will be determined as follows:

1. Two midterm exams (14% each midterm)
2. Article Discussion, Project Description (4% each)
3. Notebook: Experimental protocols and data (12 entries) (0.5% each)
4. Experimental Participation (minimum of 3 experiments at home or in lab) (6%)
5. 2 Quizzes (Buffer Concentration & RNA concentration) (4% each)
6. 2 reports ("Test transcriptions" and "Buffers & Breaking Jello") (8% each)
7. Oral Presentation of home project (14%)
8. Oral & Poster Presentation of riboswitch project (14%)

Final Letter Grades will be assigned according to this scale	
A: 93 – 100	C+: 77 – 79
A-: 90 – 92	C: 70 – 76
B+: 87 – 89	D+: 67 – 69
B: 83 – 86	D: 60 – 66
B-: 80 – 82	F: 59 or below

Course Policies:

1. **Make-Up Policies:** Students missing an exam or quiz due to a justified or unjustified absence may arrange a make-up opportunity directly with me. In the case of justified absences students may take a make-up examination for full credit. In the case of unjustified absences, a late penalty of 5% for the first day and additional 3% for every day late will be applied to the grade of the first make-up examination. If a student misses a second examination due to an unjustified absence, a late penalty of 8% for the first day and additional 5% for every day late will be applied. A third examination missed due to an unjustified absence cannot be made up. All days (including Saturday and Sunday) are counted when assigning a late penalty.

A missed examination should be made-up promptly, preferably within a day of the missed examination but no later than 7 days after the missed examination. After 7 days, make-up exams will only be allowed for documented circumstances beyond the control of the student. Please communicate with me promptly before or after missing an exam so that reasonable arrangements for your specific circumstance can be made.

2. **Accessibility & Disability Services:** If you may need an accommodation due to a disability, please contact me privately to discuss your specific needs. A memo from Disability Support Services (DSS) authorizing your accommodations will be needed.
3. **Academic Integrity Policy:** Cases of academic dishonesty will be handled in accordance to the student academic integrity policy recommendations. Please visit the website below for more information on these policies. In most cases, students who are found cheating will receive zero points on the examination in question and a letter describing the incident will be sent to the Office of Student Conduct & Civility Education, the Office of the Registrar and to the department chairperson. When necessary, violations will be reported to the Office of Judicial Affairs.

<https://www.towson.edu/about/administration/policies/03-01-00-student-academic-integrity-policy.html>

4. **Chemistry Department Statement on Classroom Diversity and Inclusion:** The students, faculty, and staff at Towson University represent a diverse and vibrant community of learners and scholars. As a community, we value the unique contributions of each individual and promote active participation in all aspects of the learning process by each community member. Your instructor supports Towson University's goal of fostering a diverse and inclusive educational setting. Your instructor strives to create a classroom environment built upon the principles of mutual respect and support. Toward this end, all members participating in this course are expected to demonstrate respect for all other members of the class. If you feel these expectations have not been met, please speak with your instructor or the designated diversity liaison, Dr. Cindy Zeller (czeller@towson.edu). For further information regarding the diversity and inclusion policies of Towson University, please see:

<http://www.towson.edu/about/diversity.html>

<https://www.towson.edu/fcsm/about/diversity/plan.html>

<http://www.towson.edu/fcsm/departments/chemistry/diversity.html>

5. **Other policies:**

Anybody with a health situation, including pregnancy, should talk to the instructor regarding lab safety issues. Please contact me privately to discuss your specific needs and to obtain additional information about the chemicals that will be used in this class. The department of chemistry policy for pregnant students is:

Pregnant students should consult their physicians for advice on whether or not to perform experiments in lab. Students are encouraged to provide their physician with a list of the chemicals that they might be exposed to while in lab. They should also check the MSDS* sheets to be aware of the hazards of the chemicals. If a student is advised against performing lab work, then faculty must make accommodations for the students to be excused from some or all of the experiments. These accommodations may include:

- a. performing "dry" experiments only, in a place free from exposure to ongoing experiments
- b. performing the wet chemistry at a later date
- c. receiving an incomplete grade in the course pending completion of experimental work

Tentative Summary of Contents

Asynchronous activities are in blue. Graded assignments are in red.

Week	Date	All	In Person	At home
1	01/27/21	Laboratory Safety – Read and Complete Quiz Tuberculosis & Riboswitches Concentration/Buffer Review Assign Groups Design at home project Install PDB viewer Pymol Synchronous time: ~4 hours	Drop/Add Period ends on Feb 2, 2021	Drop/Add Period ends on Feb 2, 2021
2	02/03/21	Articles Discussion Pymol Exercise Work in groups to find sequences, design primers Group communication strategy Watch PCR video (1:30) (1) Write notebook PCR protocol Synchronous time: ~4 hours		
3	02/10/21	Excel Exercise Presentation explaining sequence design & at home project Watch video test transcriptions (0:55) (2) Write notebook Test transcription protocol Synchronous time: ~3 hours		
4	02/17/21	Quiz: concentration of buffers (asynchronous) Class Objectives Survey Group peer evaluations. Watch video small urea-PAGE gel (2:30) (3) Write notebook Small Urea Gel Protocol (4) Write notebook Buffer preparation at home Synchronous time: ~1 hour	PCR of selected molecules. Set test transcriptions Approx time: 4 hours	Prepare buffers with acetic acid, ammonia and salt. Record results in notebook (entry #4)
5	02/24/21	Watch video Large Scale Transcription (0:45) Watch video casting large gel (1:20) (5) Write notebook “Large Scale Transcription” and “Casting Large Gel” protocols (6) Write notebook red cabbage indicator & pH scales	Urea-PAGE to determine best conditions. Repeat test transcriptions if necessary. Approx time: 5 hours	Prepare cabbage indicator and pH scale. Record results in notebook (entry #6)
6	03/03/21	Watch video running large gel (1:30) (7) Write notebook “Running large gel” (8) Write notebook progress with experiment at home	Urea-PAGE to confirm best conditions or test additional conditions. Set large scale transcription. Approx time: 4 hours	Measure pH of selected products. (e.g measure ability to break jello, measure pH of soil samples, measure pH of different shampoos,

				pH changes in blueberry color)
7	03/10/21	Watch video Cutting Band (1:25) Watch video Electroelution (0:50) (9) Write notebook "Cutting Band" and "Electroelution" Submit report explaining results of test transcriptions	Cast large gel and load with large scale transcription. Approx time 4 hours	Other components of experiment. Record results in laboratory notebook (entry #12)
8	03/17/21	Spring Break (no classes)		
9	03/24/21	Midterm 1: RNA design, expression and purification. Buffer Concentration & preparation Synchronous time: 2 hours		
10	03/31/21	Submit report explaining success in buffer preparation & other parts of home experiment Watch video "Concentrating RNA" (approx. 30 min) and "Measure RNA concentration (0:40)" (10) Write notebook: "Concentrating RNA" and "Measure RNA concentration". Include experimental results.	Electroelution & Concentration Approx time: 6 hours Last day to withdraw from classes: April 5, 2021	Other components of experiment (if needed) Last day to withdraw from classes: April 5, 2021
11	04/07/21	Watch video "Preparing RNA sample (0:45)" & "Titration Experiment (approx. 1 h)". (11) Write notebook RNA sample & titration experiment. Include experimental results (12) Write notebook Other components of experiment	Measure RNA Concentration Record results in notebook (include in notebook entry #10) Approx time 2 hours	
12	04/14/21	Quiz: RNA concentration Synchronous time: ~1 hour	Binding experiment Approx time: 6 hours. Record results in notebook (include in notebook entry #11)	
13	04/21/21	Oral Presentations of at home project Analyze binding experiments Synchronous time: ~6 hours		
14	04/28/21	Analyze binding experiments. Prepare Poster presentation Prepare Oral presentation Midterm 2: RNA concentration, titration & binding Synchronous time: ~2 hours		
15	05/05/21	Oral Poster Presentations of Riboswitch Project Survey Synchronous time: ~6 hours	Last day of classes: May 11, 2021	Last day of classes: May 11, 2021
16	05/17/21	Final Examination: Monday, May 17 from 10:15 to 12:15 pm		

