

Structural Biochemistry - Chemistry 391 – Fall 2018

TuTh 9-10:20 in Eliot 314

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Office Hours: MTuW 2-3:30 or when my door is open

Website: <http://people.reed.edu/~glasfeld/Chem391>

Overview: This course has two purposes: (1) To develop a structural and thermodynamic understanding of biochemical structure, specificity and catalysis, and (2) to provide the tools to independently investigate and understand the structural basis of biochemical function. The first quarter will focus on the fundamentals of biochemical structure and properties, with attention to equilibrium phenomena. The 2nd quarter will center on catalysis and kinetics.

Readings: The principle textual sources for this course are my lecture notes, which I will post on the course web site in advance of the lecture in question. Secondly, I will point you to review articles and research publications relevant to the lecture. I strongly recommend that you use at least one external reading source per week to help expand your view of the field.

There is no required textbook for this class, but I have been tempted to use “The Molecules of Life” by Kuriyan and co-authors. It is on 2-hr reserve in the library. Two other textbooks of note: Biochemistry by Voet & Voet is my favorite general text covering structural material. Lehninger’s biochemistry text is more concise and approachable. Both are on reserve. There are many other general biochemistry texts in the library available for loan and inexpensively offered online, second hand. Find one you like and use it as often as needed.

Assignments/Evaluation: You will be evaluated on the following:

- Weekly problem sets (assigned Thursday and due on Thursday).
- One 20-minute pop quiz
- Two 3 hr take-home exams in the 7th week and during finals week.
- A review article with due dates for a first (11/21) and final draft (12/11).*

Please note that no late work will be accepted without a valid excuse.

Participation: My assumption is that you will attend all meetings of the class and take responsibility for obtaining notes from peers if you unable to attend. There will be regular class discussions and you will be expected to participate fully.

Academic Conduct: In submitting written work for evaluation, I assume that the assignment reflects your understanding of the material. I encourage discussions on work turned in for problem sets and sharing preliminary drafts of the review paper, though the paper must reflect your own personal investigation of the topic and use your own words and ideas. The quiz and exams are to be taken under defined conditions, with no collaboration allowed.

* If you took Chem 392 with me last Fall, you have already done a research paper. I will offer an alternative option to you folks, a 1500 word research proposal. You get to choose which to complete.

Order of Topics

Intermolecular forces
Covalent structure and information flow in biology
Primary and secondary structure of proteins
Physical methods in structural biochemistry
Tertiary, quaternary structure in proteins, protein folding
Nucleic acids, chemistry and conformation
Molecular recognition & glycoconjugates
Membrane proteins: receptors and transport
Enzyme kinetics and catalysis
Examples of enzyme classes
Redox catalysis
Specificity in catalysis; replication, translation

Library Resources

While the textbook is an excellent place to learn about any topic, it is limited in trying to present everything in biochemistry in a limited space. My recommendation is to look beyond the textbook on a weekly basis and search for alternative and more specialized sources of information. Some that I am particularly fond of:

T. E. Creighton, *Proteins* 2nd Ed.
Branden and Tooze, *Introduction to Protein Structure*, 2nd Ed.
Petsko and Ringe, *Protein Structure and Function*
Kuriyan et al., *The Molecules of Life*
A. Fersht, *Structure and Mechanism in Protein Science*
S. Lippard and J. Berg, *Principles of Bioinorganic Chemistry*

Also, this course makes extensive use of the journal literature, and I recommend that, once a week, you hunt down a literature reference, or simply pull an issue of one of the following journals off the shelf and read an interesting review or research article:

My favorite sources of review articles:

Annual Reviews in Biochemistry
Annual Reviews in Biophysics and Biomolecular Structure
Current Opinion in Structural Biology
Trends in the Biochemical Sciences

The two big journals that you should get used to checking up on each week (both reviews and research articles): *Nature* and *Science*

The more specialized journals, several of which run review articles to accompany research articles:

ACS Chemical Biology
The Journal of the American Chemical Society (JACS)
The Journal of Biological Chemistry (JBC)
Nature Structural and Molecular Biology (NSMB)
Nature Chemical Biology
Proceedings of the National Academy of Sciences USA (PNAS)