

**BCHM 461: Biochemistry I**  
**Section 0101: TuTh, 8:00-9:15 am, Chemistry 1402**  
**Spring 2003**

**Prof.: David Fushman**

**Office:** Room 1121 Agriculture/Life Sciences Surge Bldg (#296); x53461, [fushman@wam.umd.edu](mailto:fushman@wam.umd.edu) (much preferred to phone), Please restrict telephone inquiries to office hour times, except in “emergencies”. Email is welcome anytime.

**Office hours:** Tuesday, 3:00pm-4:00pm, Thursday, 11:00am-12:00noon,

**Teaching Assistant: Ms. Ranjani Varadan**

**Office hours:** Monday, 4-5pm, Wednesday, 4-5pm, Room 1122, Agriculture/Life Sciences Surge Bldg., x58710, [ranjani@wam.umd.edu](mailto:ranjani@wam.umd.edu)

**Course Description**

Biochemistry is the study of the molecular basis of life. Biochemistry 461 is an introductory course that will focus on basic concepts in biochemistry and will provide the vocabulary and grammar needed to pursue further course work and research in this field. We will cover the four major classes of biological molecules: proteins, carbohydrates, lipids, and nucleic acids. The emphasis will be on the chemical properties and three-dimensional structure of these molecules in relationship to their biological function.

**Textbooks:**

Required: *Lehninger Principles of Biochemistry*, 3<sup>rd</sup> edition, by Nelson and Cox.

Recommended: *The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry*, 3<sup>rd</sup> edition, by Osgood and Ocorr.

The publisher’s web site (<http://www.worthpublishers.com/lehninger>) that accompanies the Lehninger textbook, contains interactive tutorials to further illustrate the class material, study aids, links to protein data bases, and suggestions for further reading about some topics.

Additional recommended sources (on reserve in the Chem. library, no need to buy them):

*Biochemistry*, 2<sup>nd</sup> edition, by Voet and Voet.

*Biochemistry* 3<sup>rd</sup> edition, by Mathews, van Holde, and Ahern.

There is a course homepage at:

<http://gandalf.umd.edu/BCHM461/>

where you will find a copy of the syllabus, practice problems, study hints, and extra materials. Some of these materials will be posted as we proceed with the course. You are welcome to email your questions and comments. I do not guarantee individual responses, but errors or common points of confusion will be addressed in class.

## Course Outline

The exact order of topics and the number of lectures on each may change.

- 1. Introduction** (2 lectures) \*
  - The molecular logic of life Ch. 1
  - Biomacromolecules: Composition and principles of organization Ch. 3 pp. 53-65, 69-73
  - Energy and principles of bioenergetics Ch. 1, pp. 9-12  
Ch. 14, pp. 490-499
- 2. Water** (3 lectures)
  - Non-covalent interactions Ch. 4  
pp. 82-84, 86-91
  - Properties of water pp. 83-91
  - Acid/base properties, pH buffering capacity pp. 95-107
- 3. Protein structure and stability** (8 lectures)
  - Amino acids – structures, nomenclature, chemistry. Ch. 5  
pp. 115-126
  - Primary structure – the peptide bond, sequence homology and evolution, synthesis pp. 126-129, 150-153
  - Methods for protein purification and analysis. pp. 130-150
  - Secondary structure –  $\alpha$ -helices,  $\beta$ -sheets, turns, Ramachandran plot, structure prediction pp. 159-169
  - Tertiary structure, protein motifs & structure classification. pp. 170-177, 182-188
  - Quarternary structure pp. 171-172, 188-191
  - Protein folding and dynamics pp. 191-198
  - Methods for protein structure determination pp. 178-181
- 4. Protein function** (8 lectures)
  - Protein-ligand interactions. Oxygen binding proteins Ch. 7, pp. 203-221
  - Quantitative analysis of protein-ligand interactions Ch. 7, pp. 206-209
  - Cooperativity, allostery Ch. 7, pp. 214-216
  - Enzymes -- how they work Ch. 8, pp. 243-257
  - Enzyme kinetics – Michaelis-Menten equation,  
Lineweaver-Burke plots Ch. 8, pp. 257-266
  - Enzyme inhibition -- mechanisms Ch. 8, pp. 266-269
  - Examples of enzymatic reactions Ch. 8, pp. 269-289
- 5. Carbohydrates and glycobiology** (2 lectures) Ch. 9
- 6. Nucleotides and Nucleic Acids** (2 lectures) Ch. 10
- 7. Lipids and Membranes** (2 lectures) Ch. 11, 12

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\* Note that Chapter 3 in *Lehninger* includes a short review of some basic chemical principles, structures, and reactions. I will not go over this material in the lecture but I urge you to review it yourself, especially if it has been some time since you last saw these topics.

**Examinations will be given on the following dates:**

I	Tuesday, February 25
II	Tuesday, March 18
III	Tuesday, April 29
Final exam:	<b>Wednesday May 21, 10:30am-12:30 pm</b>

These exam dates are firm. The quiz dates will be announced on a previous lecture or earlier.

**Grading Policies.** Each exam during the semester will be worth 100 points and the final exam will be 150 points. Exams during the semester will include only the material covered since the previous exam but will inevitably draw on information from earlier in the semester. The final will cover the entire course material. The exams will include material covered in the lectures and in the corresponding sections of the textbook. Problem sets given as homework are optional, however, completing them is likely to be very helpful in your preparation for the exams. All mid-term exams will be 75 min long and will be given in the lecture hall (Chem 1402). You will be allowed to use calculators for computation only. Two of your three mid-term exams with the highest scores will count toward the final grade.

In addition, you will be given five 10-15 minutes quizzes, each worth 20 points. You will be notified about their date in advance.

Your final letter grade will be based on your total score calculated as a sum of your scores on all quizzes, on the two out of the three mid-term exams, and on the final exam (maximum 450 points). Grading will be done on a *curve* based on the overall distribution of the class scores. You will be guaranteed an A if your total score is 85% or better, a B if it is 60% or better and a C if it is above 30% of the class. Final grading will then be done using the “+/-” grading system, as follows. The cut-offs for A, B, etc grades will be determined first. Then each letter-range will be divided into three groups: all students whose scores are in the upper third of, e.g. B range will be given a B+, those in the middle will receive a B, and the lower third will receive a B-, and so on.

**Regrades.**

If you think a mistake has been made in grading your work, you *must* submit it to me for regrading no later than one week after the date on which the work was returned to the class, with a written explanation of your reasons for desiring a regrade. The entire exam is subject to regrading, which often decreases the total score. After that, the grade will be considered final. Arithmetic errors in the grading can be corrected without regrading.

**Make-up exam policy.**

Do not miss any of the exams or quizzes. If you miss an exam, **you will have a score of “0” on the exam until it is made up.** Only students with **legitimate excuses** as determined by the University policy will be given a make-up exam. For a make-up exam you will need written documentation of the emergency or illness. A missed quiz will be assigned a score of “0”. There will be no make-up for missed quizzes.

**It is your responsibility to contact me promptly to schedule a make-up exam. In any case, YOU MUST CONTACT ME WITHIN 24 HOURS OF MISSING AN EXAM.**

**All students must take the final exam.**

Please notify me as soon as possible if you know ahead of time that you will miss an exam for any reason, including previously scheduled events, religious observances, etc. According to the University policy you must tell me no later than Feb 10 (the last day of schedule adjustment period).

### **Academic integrity.**

From the *Code of Academic Integrity*, University of Maryland, College Park:

“The University is an academic community. Its fundamental purpose is the pursuit of knowledge... Essential to the fundamental purpose of the University is the commitment to the principles of truth and academic honesty. Accordingly, The Code of Academic Integrity is designed to ensure that the principle of academic honesty is upheld...”

The *Code of Academic Integrity* is available on the University web site at

[http://www.inform.umd.edu/CampusInfo/Departments/JPO/code\\_acinteg2a.html](http://www.inform.umd.edu/CampusInfo/Departments/JPO/code_acinteg2a.html)

And is printed in the current Schedule of Classes. Students are responsible for knowing and understanding the content of the Code.

There will be zero tolerance to violations of the *Code of Academic Integrity*. Suspected cases will be reported immediately to the appropriate authorities. The standard penalty for violations of the *Code of Academic Integrity* is a grade of “XF”

Specific guidelines relevant to this course include:

1. All work that you submit for grading in this course (i.e. examinations) must be the original work of the student whose name is on the work.
2. You may use a calculator for most in-class exams, but **only** for computation. Any other use is a violation of the University’s *Code of Academic Integrity*.
3. Other actions such as falsification of excuses for missed exams or submission of an altered, graded examination for regrading, etc., are also violations of the *Code of Academic Integrity* or the *Code of Student Conduct*.

### **Honor Pledge**

The University of Maryland Honor Pledge reads:

*"I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination."*

The Pledge statement should be handwritten and signed on the front cover of all examination papers submitted for evaluation in this course. Students who fail to write and sign the Pledge will be asked to confer with the instructor. Further information about the Honor Pledge can be found on the University web page:

<http://www.inform.umd.edu/CampusInfo/Departments/JPO/AI/honorpledge/>

### **Teaching assistance.**

The teaching assistant for this course is *Ms. Ranjani Varadan*, an advanced graduate student in the Biochemistry program. We are happy to help you with the material during office hours. If necessary, we will arrange other times to meet. If you believe a mistake has been made in lecture (I guarantee this will happen), please speak up or inform me afterward. Please ask questions in lecture if something is not clear.