



CHEM376LC: General Biochemistry I Fall 2020

INSTRUCTOR:

Dr. Nathan S. Astrof PhD

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Office: HN1321B

Office Hours: Tuesday 11:00 – 1:00, or by appointment. All office hour and appointment meetings are via Zoom.

CLASS MEETINGS

Lecture: Mon and Wed 4:10 - 5:25; room: Online

Recitations: (R01) Wed 2:10 – 3:00; (R02) Wed 12:10- 1:00; (R03) Tues 6:10 – 7:00; (R04) Tues 2:10 – 3:00; (R05) Tues 4:10 – 5:00; (R06) Tues 5:10 – 6:00; (R07) Tues 7:10 – 8:00 All recitations are online.

EXAM DATES:

Midterm 1: September 21

Midterm 2: October 26

Midterm 3: November 23

Final Exam: TBA

SCOPE OF THE COURSE: This is the first course of a two-semester program recommended for chemistry, biochemistry, and pre-health-professional students, or for graduate students requiring a broad introduction to biochemistry. The major objective is to develop the tools to analyze biological function in chemical terms – the physical, chemical, and biological principles by which a biomolecule, reaction, or pathway operates – and to provide a comprehensive overview of the chemical concepts that govern biological processes. Topics to be covered include properties of water; principles of bioenergetics; structure, chemical properties, and function of proteins, nucleic acids, carbohydrates, and lipids; principles of recombinant DNA technology; membrane properties and transport; enzyme kinetics, mechanism, and regulation; and fundamentals of metabolism.

COURSE LEARNING OUTCOMES: Upon completion of this course, students should:

- Develop comprehensive knowledge of physical and chemical features that govern reactivity and behavior of metabolites and macromolecules within living systems, including the role of acid-base properties, electrical charge, thermodynamics, and kinetics of biological systems, and their application to understand certain cellular phenomena;
- Be proficient in relating the structure and chemical/physical properties of biological macromolecules with their biological function;
- Acquire skills to quantify biochemical parameters such as the relationship between pH, pK_a , and charge of a biomolecule; kinetic properties, reaction rates, and chemical mechanism; and thermodynamic parameters and chemical activity.

PREREQUISITE COURSES AND BACKGROUND: Students should have completed two semesters each of biology, general chemistry, and organic chemistry – and be able to **apply** the information from those disciplines. More specifically, students should have knowledge of fundamental biological principles (e.g. cellular structure, function, and activity) and the structures and chemical reactivity of organic functional groups, and should be facile with mathematical calculations involving exponents, logarithms, and basic algebraic equations. It is your responsibility to be familiar with the

background material, and to review background skills and information as necessary.

EXPECTATIONS OF STUDENTS AND INSTRUCTORS: Students should come to class prepared to learn, stay current with the material, and review background material as necessary. You should keep up with lectures, reading, recommended or assigned problems, and skills (more under “**Strategy**”, ahead). CHEM 376/640 has a required recitation session each week to review lecture material, practice skills and participate in group-learning activities. Recitation questions are assigned in advance; to make the best use of recitation sessions and to earn class credit, it is highly recommended that you work the problems before the recitation. You are required to attend the recitation to which you are registered.

Instructors and Recitation TAs facilitate student learning during lectures and recitations, respectively, and assist you in applying information and skills to solve problems. However, you are responsible for developing and applying the necessary skills and integrating individual lectures into a comprehensive picture. Peer Group Leaders, and your Instructor will be available on a regular basis for office hours to assist you with course material. Please make use of this resource, and come to us with specific questions (*i.e.* not expecting to have lectures repeated or asking for extended tutorials/reviews). If you cannot meet during these scheduled times, please contact us –*by email, or in person* – to arrange an alternate appointment time that fits your schedule. You should NOT wait until examination time – worse yet, until the end of the semester – to resolve topics that are unclear to you or to learn skills to solve problems. Students learn best when there is a climate of respect among students and between students and instructors. Every effort should be made by all involved, at all times, to foster a productive, positive, communicative, and respectful environment.

CLASS ATTENDANCE: Your presence in both lecture and recitation is important, as some material will be covered that is not included in the book, different topics may be emphasized, and quantitative skills will be practiced. Please arrive to class/recitation on time, stay until the end, and make sure your cell phone (including texting functions) is silenced and put away.

RECITATIONS: Recitations provide an excellent opportunity to work on problems in a group setting, to ask questions and resolve uncertainties in the course material. Attendance and participation at recitation are mandatory. To obtain any credit for attending a recitation, you must arrive on time, actively participate in the recitation discussion (by asking or answering questions) and stay until the end of the recitation. You must attend the recitation section that you enrolled in. There are no make-up recitations and there are no excused absences for recitation. However, you may miss up to two recitations during the semester without penalty.

COURSE RESOURCES: You will be provided with PowerPoint-based note sets on Blackboard before each topic is covered in class. These materials are designed to facilitate note taking by emphasizing important discussion points, structures, or figures – but they are only “templates” to assist with taking notes in class and by no means replace the need to attend lectures, nor do they cover all material discussed in class. In addition, recitation questions and practice problem sets will be posted on the Blackboard website. In addition to office hours, some of the Peer Group Leaders may offer weekly focus groups to review/practice skills and problems and in some cases group review sessions before exams. **Under no circumstances are TAs or Peer Group Leaders ever permitted to charge a fee for you to attend any office hours, reviews, focus groups, etc.**

GRADING: Final course grades will be assigned based upon performance on homework, recitations, quizzes and exams. **Any material covered in class, recitation, in the PowerPoint notes, or that you have been assigned to read (whether covered in class or**

not) may be included on an exam. Exams are scheduled in advance (see first page and calendar). Homework will be assigned in lecture and must be submitted by the due date to obtain any credit. Your grade will be computed using the following formula:

Recitation problems	20 points
Quizzes	10 points
Homework	10 points
Exam 1	115 points
Exam 2	115 points
Exam 3	115 points
Final Exam (cumulative)	115 points
Total	500 points

In EXTREME cases of scheduling conflicts or illness, if a documented absence is deemed excusable, one midterm exam can be missed. In these cases, students are required to notify Dr. Astrof of the need to miss the exam in ADVANCE of the scheduled exam – if you are too sick to take an exam, you (or someone else) must still contact me **before** the exam period, **not after** the exam. There is no make up exam; the mean of the remaining scores will be counted as the score of the missed exam. **There are NO make-ups the FINAL EXAM for any reason. If you do not take the final but you are passing the class you will receive an incomplete and must make up the exam during finals week the following semester.**

A total of 500 points will be distributed as above. Grades will be assigned in accordance with the Hunter College policy on grading (which takes precedence over anything in this syllabus), and no curve will be applied to an exam or to the final grade. There is no extra credit. The following letter grades will be assigned based upon total points accrued for all course work:

Letter Grade	%
A ⁺	97.5-100
A	92.5-97.4
A ⁻	90.0-92.4
B ⁺	87.5-89.9
B	82.5-87.4
B ⁻	80.0-82.4
C ⁺	77.5-79.0
C	70.0-77.4
D	60.0-69.0
F	00.0-59.9

CREDIT/NO CREDIT: Students the opt to take the course for credit/no credit must present a signed copy of the appropriate form at least one day prior to the final examination. No forms will be signed or accepted the day of the final examination or after the examination. The

decision to request credit/no credit is irrevocable once the form has been submitted. To obtain credit, students must obtain the grade equivalent of a C in the course. Note that the number of times the credit/no credit option may be used is limited. It is the student's responsibility to determine their eligibility for the credit/no credit option.

CHEMISTRY 640: Graduate students taking Biochemistry I for credit must enroll in CHM640. Students enrolled in CHM640 must complete an additional project that will be factored into their grade. Students enrolled in CHM640 should consult the course instructor at the start of the semester to discuss the additional required project.

STRATEGY FOR SUCCESS: The study of biochemistry builds on principles of general and organic chemistry, biology, and fundamental math skills, in order to analyze the chemistry and physics of living systems – and thus you will need to integrate knowledge from several disciplines in order to develop a thorough comprehension of biochemistry. A great deal of information will be covered this semester, and it is essential that you keep up if you want to do well in the course.

In summary: this course covers a great deal of material involving application of chemical and physical principles to biological systems. It requires that you integrate skills, information, and concepts from previous coursework. In order to do well, it is important to adopt a consistent strategy of study and practice, rather than cramming before exams.

HONOR CODE: The Academic Honor System of CUNY is based on the premise that each student has the responsibility to: (1) uphold the highest standards of academic integrity in his/her own work; (2) refuse to tolerate violations of academic integrity in the University community; and (3) foster a high sense of integrity and social responsibility on the part of the University community. *This means that you will not give or receive information during an exam, not consult unauthorized sources of information during an examination, and not tolerate violations of this code by others. All written work on exams must be in your own words; repeating text from the notes, textbook and other sources is considered cheating even if such material is not directly accessed during the examination.* During an exam or quiz, having a cell phone, tablet or other electronic device in your possession (other than an approved calculator) is considered cheating irrespective of whether the device is being accessed. Students should review the Academic Honor System outlined in the Hunter College Student Handbook. Violations of the Honor Code will not be tolerated and will result in zero points being awarded for the course work in question and in the violation being reported to the appropriate office, where it will remain on permanent record. In addition, any student violating the honor code will not be able to obtain any extra points that might be distributed on exams and will receive a zero for their recitation grade, irrespective of their actual recitation attendance and participation. Please note that having yourself counted for recitation activities or submitting others work in place of your own is considered a violation of the honor code and thus will result in an automatic and irrevocable grade of zero.

ACADEMIC CALENDAR: Please consult the academic calendar for class meeting dates. Note that throughout the semester there may be inversion days when classes meet on alternative schedules. You are responsible for knowing the time and dates for class and recitation meetings.

STUDENTS WITH DISABILITIES: Students with disabilities needing academic

accommodations should: 1) register with and provide documentation to the Student Disability Resource Center (SDRC); and 2) bring the approval letter/ accessibility card to me and the recitation instructor from the SDRC indicating that you need academic accommodations.

Please do this within the first two weeks of the class.

Lecture Schedule

Lecture	Topic
1	Introduction to the Course; Foundations of Biochemistry
2	Physical and Chemical Properties of Water
3	Acids, Bases and Buffers; Diffusion and Osmosis
4	Amino Acids and Peptides
5	Peptide Synthesis and Sequencing
6	Protein Secondary Structure
7	Protein Tertiary Structure and Structure Determination
8	Protein Folding and Misfolding
9	Protein Purification and Detection
10	Protein Function: Fibrous Proteins
11	Protein Function: Allostery and Oxygen Transport
12	Thermodynamics of Living Systems
13	Thermodynamics of Living Systems
14	Enzymes: Fundamentals and Properties
15	Enzymes: Characterization and Kinetics
16	Enzymes: Mechanisms and Cofactors
17	Enzymes: Inhibition and Regulation
18	Carbohydrate Structure and Function
19	Carbohydrate Structure and Function
20	Lipids and Membrane Structure
21	Lipids and Membrane Structure
22	Lipids and Membrane Structure
23	DNA Structure and Function
24	RNA structure and Function
25	Nucleic Acid Binding Small Molecules and Proteins

Notes: