SYLLABUS

Introduction, Policies, & General Education (HUB) for Biochemistry I & II
Section A1

Fall 2025/Spring 2026

Welcome to Biochemistry!!! The two-semester series of Biochemistry I and II were designed as a single course of study, and both semesters should be taken for a complete picture of this important and foundational field of biochemistry. Both courses are not required and many opt for just the fall course, which offers a foundation in understanding the molecules that make life possible. The second semester offers a foundation in understanding energy transformations and the chemical principles under which these molecules interact.

The field of biochemistry encompasses a large and diverse field of inquiry. It obviously interfaces with both chemistry and biology, but as well psychology, physics, mathematics, astronomy, bioinformatics, and of course, medicine all seek a level of biochemical understanding. Yet, Biochemistry is its own stand-alone discipline. The student studying biochemistry essentially needs a high-school level of understanding of the principles and nomenclature of cell and molecular biology; however, understanding biological molecules most importantly requires a solid foundation in the chemical principles learned in general and organic chemistry. Without this background, a student will struggle to grasp the concepts and significance of biochemistry.

Another purpose of these courses (421/422 & 621/622) is to introduce biochemistry in a way that lays a foundation for further study; be that in elective courses here at BU, in graduate school in virtually any biology or chemistry discipline, or in professional schools; including medicine, dentistry, nursing, and even law. For example, this two-semester course, along with the two-semester Molecular Biology courses (BI 552/553), covers all the material one would confront in the Graduate Record Subject Examination in Biochemistry, Cell and Molecular Biology, and in particular for the MCAT5 examination with its emphasis on biochemistry. The competencies listed for the MCAT5 exam will require that both semesters (Biochemistry I & II). The course will primarily take a problem-solving approach, integrated with a certain amount of memorization that is required to become fluent in the language of biochemistry. As mentioned above, this two-semester series is considered an integrated whole course, although there are distinct flavors in each semester. The first semester describes the molecules of life and the chemical principles under which they operate to maintain life. The second semester describes how these molecules are utilized and inter-converted, from small molecules to macromolecules and the function of organelles, and how energy is derived from them to power life as we know it. This course is a good preparation for advanced courses such as Physical Biochemistry (CH525), Protein Chemistry (CH722), Chemical Biology (CH423), Enzymology (CH625), Epigenetics (CH626), Metallobiochemistry (CH 634), RNA Structure and Function (CH427), Molecular Biology Laboratory (BB522), Chemical Biology Laboratory (CH 524), and Molecular Biology I & II (BI552 & BI553).

ENROLLMENT IN THE FALL

As alluded to above, this course constitutes the first of a two-semester course in introductory biochemistry. It is designed for undergraduate science majors, in particular those majoring in Biochemistry and Molecular Biology (BMB) or Chemistry: Chemical Biology, as well as and first-year master's students. Students are enrolled in BB 421, BB 527, or BB 621, depending on their program of study. In the fall, students will attend lectures in one of two parallel lecture sections (Section A1; MWF or Section A2, TR) (except those in BB 527, which is the lab only). These two sections will cover the same material at roughly the same pace and order. However, the A1 and A2 lectures do not share common exams. Therefore, students should attend the lecture in which they are registered to ensure they have all of the section-specific information for the midterm exams. Graduate students (those in BB 621) will have a scholarly research topic/project and will meet at various times during the semester to discuss topics and other issues related to this assignment. For the laboratory (Section B), all students perform the same basic laboratory experiments and attend either one of two pre-lab discussion sections (Section C). In the spring (BB 422), all students will attend the same lectures, take the same exams, and perform the same laboratory experiments.

PREREQUISITES

All students are REQUIRED to have passed two semesters of Organic Chemistry with a C or better to take Biochemistry I & II. While this is the only prerequisite, students who have not had any biology since high school will find that in certain portions of the course they will need to work harder. Likewise, while the four semesters of prerequisite chemistry are required, the levels at which this chemistry was taught (or learned) will vary drastically among students. For EVERYONE, we will provide material in cell and molecular biology, and general and organic chemistry, available on *Achieve*, that comprises required prerequisite material for the class, as well as reading from Chapter 1 of the textbook. Students may find study of this material in the first week or two of the class will allow you to assess your preparedness for this course. Because of the structure of the curriculum here at BU, a majority of students who take biochemistry have also had BI 108 (Intro Biology 2) and perhaps BI 203/206 (Cell Biology/Genetics). For those who have not taken such courses, or need a refresher, we have included Pre-requisite Material (available on the Lab Blackboard (Bb) site (see below)). This material includes a list of expected prior knowledge in both chemistry and biology, a video on basic molecular biology (It will review essential fundamental concepts required for successfully mastering the material related to the biochemistry of information transfer (how the information in DNA is stored and utilized)), and a quiz on the video material. This quiz and 1-2 questions on Exam 1 will comprise 2% of your final grade and is a great incentive to get up to speed at the beginning of the course. Others may prefer independent study of one of the many textbooks used in these courses (e.g., Albert's "Biology of the Cell" or Cooper & Hausman's "Cell"), or you could form a study group with some of your classmates who have had this course to help you review some of the essential biology concepts you should have been exposed to in your high-school biology course. For those of you who have had BI 203, you may recognize some of the biochemistry and molecular biology to which you were exposed.

TEXTS & WEB SITES

The course uses **two** textbooks for the entire two semesters: (1) "Lehninger's Principles of Biochemistry 8th edition" by Nelson and Cox. The textbook is generally offered as an "e-book" through enrolling in "*Achieve*." This resource also has required homework and quizzes to assist in your study, as well as supplemental materials and problems, as well as answers to all the problems in the textbook. (2) The laboratory will utilize "Biochemistry Laboratory Manual 5th edition" by Tolan & Medrano. This laboratory manual has introductory material for each laboratory exercise that describes the theoretical background of each experiment and problems for study.

For the Fall Laboratory, many of the exercises have been updated, so the details of the weekly procedures will be provided online each week or so on the Lab Blackboard (Bb) site (see below).

These courses have multiple web sites. The A1 course (those in Section A1 in BB 421 & BB 621 from CAS or MET) has its own **web site** (http://www.bu.edu/aldolase/biochemistry) and will NOT use Blackboard. It was designed and is managed by Prof. Tolan and does not require Kerberos passwords for access. The Blackboard site for A1 is only for FirstDay. There are separate Blackboard sites for the A2 course – BB421/621 A2 Biochemistry 1 (Fall 25) and the Laboratory – BB421/527/621 A1/A2/C1/C2 Biochemistry 1 (Fall 25). Those registered in BB 527 should use the Laboratory Blackboard site. For the A1 section, all readings, problems, announcements, examples of old exams, course outlines, etc. will be available on the A1 web site.

In addition, because a problems approach is essential for learning biochemistry, students will use the companion Web site for the textbook: *Achieve*. The site has the homework assignments and assigned quizzes, as well as access to an interactive e-Book and other resources for key concepts encountered in the course, such as interactive metabolic maps, animated figures for biochemical techniques and enzymatic mechanisms, problem solving videos, and other resources.

For those who are going on to graduate study in chemistry or biochemistry, a more advanced text such as Mathews, van Holde, and Ahern's "Biochemistry," or Garrett & Grisham's "Biochemistry," are recommended. For those who are premed, another text, Devlin's "Textbook of Biochemistry with Clinical Correlations" could be purchased. In addition, a subscription to the American Chemical Society journal, "Biochemistry," and/or the American Association for the Advancement of Science journal "Science" are both available at drastically reduced prices for students and are useful for those going on in biochemsitry.

GRADES

We don't wish anyone to be overly "grade conscious," but this can't be helped. Therefore, it is important to understand at the very outset exactly how you will earn your grade. Depending on which course you have enrolled, the exact grading process will be different (see syllabus). All the courses (except BB 527) have FOUR common aspects; the lecture examinations, the homework, the Pre-requisite quiz, and the laboratory. In the first semester for Section A1 there will be 4 one-hour exams and one two-hour comprehensive final exam, which will be held at the scheduled times denoted on the syllabus: schedule. The Final Exam is mandatory and no make-ups will be given, so make your plans accordingly. For the five exams, each of which will cover roughly the same amount of new material, from

7-9 lectures. The final exam will be part new material and part cumulative. The exams will be of a more problem-oriented nature, although due to the size of the class and the amount of material, multiple-choice and matching type questions cannot be eliminated. The examinations will cover material from lecture only, but pedagogical concepts from the laboratory might creep in. In addition, several of the homework problems could re-appear on the examinations.

Because everyone makes mistakes, only your best 3 of the 4 one-hour exams will be used for computation of your grade. As such, ***no make-up exams will be given***. If you miss an exam for ANY reason, it will count as your lowest exam. If you miss **more** than one exam (which must be for a legitimate reason (due to a serious illness, a personal or family emergency, or a religious observance; see below)), your two remaining exams will be averaged to give you the third score. If you miss the Final exam, you will be given an Incomplete (I) (see below).

The exams during the second semester will be organized slightly differently. The details will accompany the course schedule to be given out in January.

Homework Policy: On the *ACHIEVE* website, each semester there will be 30-40 problem-sets assigned as homework. In addition, there will be about 15–20 Adaptive Quizzes from the chapters in the assigned reading designed to help study for each exam. All homework and quizzes are due at midnight on Sundays (1–4 per week). In the Spring, the Quizzes are due by 5 pm on Tuesdays right before the exams. These are hard deadlines, there will be no makeup opportunities on the homework or quizzes regardless of any reason. The entire set of 45–60 assignments of homework and quizzes will comprise 8% of your overall grade, mostly as incentive because doing them will help prepare yourself for the exams. **Because no makeups are allowed**, approximately your lowest 20-33% of all the homework and quizzes will not count. In other words, **for Fall 2025, which will have 36 homework assignments, only your top 25 homework scores (of 34) and top 15 quiz scores (of 20) will be used for calculating your overall homework score**. Each quiz and/or homework is potentially worth the same (0.2%) fraction of your grade despite differences in the number of questions and/or problems in each assignment. For Spring 2026, **which will have 33 homework assignments, only your top 23 homework scores (of 33) and top 12 quiz scores (of 16) will be used for calculating your overall homework score**.

COURSE SCHEDULE, GETTING HELP, AND SUCCESS STRATEGIES

All of the listed lectures and labs have required attendance. Much of the material presented in the lecture and lab discussion sections is not found in any of the textbooks. We will attempt to follow the accompanying schedule denoted in the syllabi, which have been prepared with some degree of optimism. It must be remembered that this is a difficult course, both in content and in the time required, particularly with the inclusion of the laboratory and its necessary theoretical background. While this in an introductory biochemistry course, it isn't a "survey" course since, as noted above; biochemistry is an interdisciplinary science that requires background, formal and informal, in several aspects of chemistry and biology. This is the rationale behind providing students with a list of terms and topics with which they should be familiar before tackling this course.

PLEASE don't hesitate to approach an instructor or teaching fellow if the course pace is too slow or too fast for you, or if you have difficulties. ANY difficulties should be solved whenever they occur rather than be allowed to pile up to the end of the semester. This chiefly applies to your understanding of the material. If you have difficulties in comprehension, please ask for the available help during office hours or at another arranged time. All members of the teaching staff, professors and teaching fellows, check their email regularly and will normally respond within 24 hours. Due to the interdisciplinary nature of the biochemistry field, bear in mind that the educational background of students in this course is different. Areas in which we seem to be "creeping" to the biologist may seem like a jet flight to the chemist, and in other areas, of course it will be exactly the opposite. This course offers you the opportunity to form multidisciplinary study groups with other students not in your major who have different diverse backgrounds. If there are persistent difficulties, see Dr. Tolan who can refer you to outside tutors in biochemistry.

Through years of experience, we have learned from successful students that one is advised to recopy one's notes daily or weekly. You would be surprised at how well this helps for the comprehension and review of important points and "jogging" your memory. The reading for each lecture is set out in the syllabus. It is also available on the class web site. It is best to read the textbook prior to lecture and work through the "suggested" problems. Following the lecture is a good time to recopy notes and work through the problems. Although the answers to all the homework problems are on *Achieve*, it is best to work through each problem before looking at the answer. Do not hesitate to attend office hours to ask questions about lecture material or the assigned problems, especially those for which your answer and the provided answers differ.

Workload: You should expect to spend at 4-8 hours per week outside of class studying for the lecture portion of BB 421/621 or BB 422/622 (i.e. ~2 hrs per lecture). The required work includes (*i*) reading the textbook in preparation for class, (*ii*) rewriting your lecture notes after class, and (*iii*) working on the homework problems. In addition, the work associated with the laboratory portion of the course is constant and includes preparation of the weeks protocols and notebook entries, then analysis of the data from each week's lab and

preparation of the report. You are encouraged to work with your lab partner, or a group, for all of this except the report. You should expect to spend 3-6 hours per week on the laboratory assignments. The success students have in this course is strongly linked to how much time and effort they put into it, so if you want to succeed be prepared to consistently do the necessary work.

You should feel free to ask questions during the lecture. That is part of what the lecture is for, and we strongly encourage it. If you are attending lecture in person and wish to ask a question, raise your hand and the instructor will get to you as soon as they reach a suitable break. We feel very strongly that there is no such thing as a stupid question. If, after some thought, you're still unsure about something, then you can bet that a lot of your classmates are too. We expect each of you to listen respectfully, as we will, to any questions your classmates ask in class, even if the answer seems obvious to you, as you should expect other people to be appropriately respectful when you have a question.

We can't over emphasize the power of doing the Homework. The syllabus lists some relevant problems associated with each lecture, which will comprise the bulk of the homework questions. Completion of these homework assignments will enhance your understanding of the material and help you to identify concepts that you might need additional help mastering. You are encouraged to do the Homework independently or in small study groups. Any questions you have about these problems or concepts from lecture or assigned reading should be addressed at office hours. You can expect ≥10% of the points on each exam to come **directly** from these suggested problems.

Office hours and finding help: Open office hours are posted for Dr. Tolan as well as the other instructors and ALL the teaching staff on the Staff page of the web site. If you cannot attend the office-hour time of your instructor or teaching fellows, there is a matrix of office hours for the entire teaching staff on the web site. As well, individual appointments can be made by sending an email with several suggested times. Office hours are not just for discussion of course material, but are intended for personal matters such as grade discussions. Dr. Tolan, and the entire staff can also be reached by email with quick questions that may not require face-to-face time. For these emails, please include in the subject, "**Biochemistry Class**." If that term is in the subject line, I will generally respond to emails within 24 hours. If not, it might go to the spam folder and replies could be delayed or not occur.

ACCOMODATIONS

Students with documented disabilities, including learning disabilities, may be entitled to accommodations intended to ensure that they have integrated and equal access to the academic, social, cultural, and recreational programs the university offers. Accommodations may include, but are not limited to, additional time on tests, limiting distractions, and note-taking assistance. If you believe you should receive accommodations, please contact the Office of Disability & Access Services (25 Buick Street, Suite 300, 617-353-3658) to discuss your situation. This office can give you a letter that you can share with instructors of your classes outlining the accommodations you should receive. The letter will not contain any information about the reason for the accommodations. If you already have a letter of accommodation, you are encouraged to share it with your instructor as soon as possible. If you need any special accommodations for this course, lecture or lab, such as extra time to complete assessments, specific room requirements during exams, etc., you need to notify Prof. Tolan and the appropriate lab coordinator about your needs as soon as possible but **no later than a week before the first exam of the semester**. This includes providing a letter from the Office of Disabilities and Access Services stating the precise nature of the accommodation. Time is needed to plan for these requests, and last-minute requests may not be honored. Even if you do not yet have documentation, let us know about your needs as soon as possible. Attending office hours or even a quick email during the first week or two of class are good ways to communicate your needs to the teaching staff.

DIFFERENCES OF OPINION

If you believe that an error was made in correcting any exam, regrade requests are done exclusively through GradeScope. If you believe that an error was made in correcting any laboratory notebook, report, quiz, or write-up, bring it to the attention of your TFs. If any unresolved issues remain after consulting with your laboratory TF, please bring the issue to the attention of the lab coordinator, Dr. Szymczyna.

Regardless of what you are disputing, you must bring it to the attention of the appropriate staff member or otherwise deal with it **within one week** of its distribution, and the staff will thoughtfully consider the problem. Any mistakes in the grading of exams, quizzes, etc. will be corrected quickly and happily. Please be aware that re-grading may need to consider a fresh look at the entire assignment. However, changes in marks and grades will not be considered after the one-week "review" period. Likewise, if there is a concern about anything in the lecture, you have the responsibility to bring that problem to the attention of your professor before the next lecture or at the very least within one week. We value your feedback and we will try to help anyone and everyone as much as we can.

ACADEMIC CONDUCT

Integrity is the foundation of all academic endeavors. In this regard, lack of integrity is a severe violation of the spirit of inquiry and search for truth. It is expected that every aspect of your performance and behavior will abide by this academic honesty. The College of Arts and Sciences Academic Conduct site offers online resources for those who need reminding of these principles and the policies developed to ensure academic honesty. If you are caught cheating on an examination, you will be awarded a "zero" for that exam and the incident will be reported to the Academic Conduct Committee in accordance to the Boston University Academic Conduct Code. For specifics on cheating or plagiarism in the laboratory, see below. The URL for Boston University's undergraduate Academic Conduct Code: *https://www.bu.edu/academics/policies/academic-conduct-code/*. The basic rule of thumb is "DON'T DO IT!"

LAB SECTIONS

The biochemistry laboratory is designed to introduce you to modern techniques used in biochemical research and give you hands-on experience "at the bench." It is aimed to help you appreciate how biochemists design and conduct experiments to test their hypotheses, and how to analyze your data and present your results. This part of the course has the greatest potential for securing jobs and post-graduate academic opportunities. The more you can say in an interview about the types of experiments you performed in this lab and your understanding of the theoretical underpinnings of the techniques, the more desirable you will be as a candidate for your potential employer or for a position in a past-graduate program.

Throughout the semester you will be working in pairs in your lab sections using extensive resources including expensive equipment, costly materials, and experienced teaching fellows (TFs), who are committed to making your lab experience as valuable as possible. We hope that you will all appreciate this collective effort and be proactive about making the best use of this opportunity.

We will have 11 sections doing the laboratory exercises each week in the Fall semester, with about 13-18 students, and two TFs responsible for the safety, instruction, preparation, equipment, grading, and procedures for their section. In the Spring, there will be 6-7 such sections. Please keep in mind that just as you would appreciate a clean work area and functional equipment when you come into the lab to do your experiments, the same is true of everyone in the section that follows yours. PLEASE clean up after yourselves as not doing so will negatively affect your grade.

You should purchase a pair of approved safety eye goggles and other items defined in the lab syllabus and described to you by Dr. Szymczyna. All pre- and in-lab work will be done in a proper laboratory notebook. In addition, any written lab reports that may be required, will use electronic automated checks for plagiarism (see below). As mentioned above, all questions and difficulties should be brought to the attention of your TFs. If you miss either of your TFs' office hours, go see one of the other TFs in the course. An office-hour matrix will be posted on both the Lab and Lecture websites (see COURSE SCHEDULE, GETTING HELP, AND SUCCESS STRATEGIES above). If any laboratory issues are not resolved by your TFs, have them contact the lab coordinator Dr. Blair Szymczyna to help resolve the issue. In addition, the laboratory coordinator, the laboratory curator (Ms. Arisdelsy Cervantes), biochemistry-lab work-study students, and/or Drs. Tolan or Liu may be in the lab for help at various times during each of the laboratory periods.

Assignment to, and attendance of, laboratory sections **is required**. Most laboratory exercises will be done with a lab partner. Partners and final laboratory sections will be arranged during the first week of classes. Your laboratory grade will be determined based on your attendance, the written accounts of your work, and overall laboratory performance as evaluated by the teaching staff as defined in the laboratory syllabus. Attendance and punctuality, preparation, effort, laboratory skills, quality of experimentation, ability to work in a group, fully analyzed data, and adherence to safety regulations will all be factored into this evaluation. The lab write-up assignments are DUE and should be available at the times requested (see Laboratory Syllabus). You should not wait until the last minute to start analyzing data and discussing results with your partner, especially those labs that extend over two or more weeks.

Since you will be working in pairs, you will be sharing data. It is your responsibility to have the complete data set for each experiment before you leave. The write-up/analysis for each laboratory **should be your own work**. Students are allowed, and encouraged, to talk and discuss the experiment and the results with each other. You can expect to have a greater understanding when you collaborate on understanding the material. However, ALL work in preparing and writing the assignment, including the generation of graphs and tables, that is turned in for grading should be done individually. *No joint preparation of lab write-ups is allowed*. Failure to adhere to this policy in the laboratory will be considered a violation of the Academic Code of Conduct and treated accordingly. **Any violation of the Academic Code of Conduct will result in failure of that laboratory, possibly resulting failure of the course, without a chance to withdraw.**

EXCUSED ABSENCES

We affirm the Policy on Religious Observance. For other students who must be absent for legitimate reasons (besides religious observations: validated medical issue or serious personal reasons), you will be given an opportunity, if possible, to make up missed work, which applies mostly to the laboratory. The policy on missed exams is stated above under GRADES.

INCOMPLETES

The use of incompletes will adhere to the College of Arts and Sciences rules. This is generally for and circumstances prevent the student from completing remaining requirements by the conclusion of the course. A substantial amount of work must have been satisfactorily completed before approval of such a grade is given. The instructor and student must sign the Incomplete Grade Agreement indicating the nature of the work and a date by which all course requirements must be completed.

STATEMENT ON COPYRIGHTED COURSE MATERIALS

The syllabus, course descriptions, text slides, and handouts created by the Professors of this course, and all class lectures, are copyrighted by Boston University and Professor Tolan. Except with respect to enrolled students as set forth below, the materials and lectures may not be reproduced in any form or otherwise copied, displayed or distributed, nor should works derived from them be reproduced, copied, displayed or distributed without the written permission of the Professors. Infringement of the copyright in these materials, including any sale or commercial use of notes, summaries, outlines or other reproductions of lectures, constitutes a violation of the copyright laws and is prohibited. Students enrolled in the course **are allowed** to share with other enrolled students course materials, notes, and other writings based on the course materials and lectures, but may not do so on a commercial basis or otherwise for payment of any kind. Please note in particular that selling or buying class notes, lecture notes or summaries, or similar materials both violates copyright and interferes with the academic mission of the College, and is therefore prohibited in this class and will be considered a violation of the student *Academic Conduct Code* of responsibility that is subject to academic sanctions.

CLASSROOM BEHAVIOR

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. This policy is outlined on the BU website (see below).

Class rosters are provided to the instructor through MyBU with the student's legal name. The teaching staff will gladly honor your request to address you by an alternate name or gender pronoun. Please advise Prof. Tolan of this preference early in the semester so that appropriate changes can be communicated to the staff and the course records.

DISCRIMINATION AND HARASSMENT

Boston University is committed to maintaining a positive learning, working, and living environment. The University Policy states that the University and its entities does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. Students who believe they have been discriminated against should contact the Equal Opportunities Office or if harassment under Title IX, contact Title IX Team. Although Boston University requires sexual misconduct prevention training, incidents and experiences occur. We care about student well-being and are committed to maintaining a healthy campus community and awareness and resources are available for anyone who may feel discriminated against or harassed. There are also online reporting mechanism you can use to report an issue or incident.

WELL-BEING

Predecessors in this course have described it as one of the most time consuming and challenging courses in the College. After graduation, these same predecessors describe the course as one of the most valuable and rewarding. In taking on this challenge, students should be mindful of their physical and mental well-being. One of the things that biochemistry has taught us is that long-term memory requires sleep. Therefore, staying up all night to memorize amino-acid structures is usually not effective. In fact, sleep is one of the most important aspects to physical and mental well-being. Although lectures start early in the morning, plan ahead and get to class. It's

often stated that 80% of success is just showing up! (the other 20% is being able to follow directions). If you have difficulties in any aspect of maintaining physical and mental health due to circumstances in the course or beyond the course, there are resources available.

The Institute for Excellence in Teaching and Learning has a clearing house of resources available. Among these is the Educational Resource Center's staff is there to work with students who need time management, study skills or academic planning assistance. They hold weekly workshops for students to assist them with test preparation, anxiety, time management, etc. The ERC offers Peer Tutoring, Writing Assistance, Language Link conversation groups, and Workshops; although, resources for tutoring in biochemistry are limited, they have excellent tutors in the basics of chemistry and biology. The ERC professional staff is also available to meet with students individually to develop a personalized plan for academic success and/or to assist them in developing specific skills. These services are free and can benefit all students who are interested in improving their academic performance.

The most important aspect of well-being is your mental state. Often during the course of the course life happens and students may feel overwhelmed. If circumstances occur in your life, please do not hesitate to ask for help. As a start, student health services offers a variety of mental health resources for you.

GENERAL EDUCATION: THE BU HUB

HUB Units earned in the Fall:

Quantitative Reasoning II (QR2)

Quantitative II Outcome 1

Students will frame and solve complex problems using quantitative tools, such as analytical, statistical, or computational methods. Both the lecture and the lab include calculations of force, free energy, entropy, pH, product and reactant concentrations, activities, buffer capacity, calibration curves, normalization, errors and error propagation, inhibition, equilibrium constants. Algebra and calculus, as well as graphical tools are used too solve problems posed in class lecture and data from the laboratory. By the completion of this course, all students will be adept at use of spread sheets such as Excel for data analysis.

Quantitative II Outcome 2

Students will apply quantitative tools in diverse settings to answer biochemical questions. Both statistics and graphs are used in a variety of laboratory exercises, as well as in-lecture quizzes, to answer questions about macromolecular size and purity, enzyme action and kinetic parameters, membrane transport and chemiosmosis, etc. Nearly every week in either lecture or laboratory, new tools and ways of analysis to answer biochemical questions are learned. Communicating quantitative data using graphs and tables supporting various models and communicate this quantitative information visually and numerically is part of many laboratory reports.

Quantitative II Outcome 3

Students will formulate, and test an argument by marshaling and analyzing quantitative evidence. For most of the quantitative calculations and tools involved in the course are used to answer a question or formulate an argument, such as what is the relative size of these macromolecules consistent with the argument, or what is the dissociation equilibria for a molecule from the enzyme, and what kind of inhibition is being exhibited?

Quantitative II Outcome 4

Students will communicate quantitative information symbolically, visually, numerically, or verbally. Visual and numerical communication of quantitative information is an essential part of written lab reports; within which questions are formulated and tested by properly displaying data, including the use of statistical analysis. Furthermore, many test questions require answers that communicate of quantitative information in the answer, often reiterating and reinforcing what was done in the lab reports, such as draw the shape of a curve indicating some kind of behavior (binding, allostery, state-transition, etc.) along with proper labeling of axes, etc. There are explicit questions coming from laboratory pedagogy included in the lecture exams.

Quantitative II Outcome 5

Students will recognize and articulate the capacity and limitations of quantitative methods and the risks of using them improperly. Recognition of the limitations of quantitative methods, such as extrapolation versus interpolation from a calibration curve, are constantly taught. Direct feedback on a weekly basis comes from the return of lab reports where these limitations are expected as part of the analysis. In particular, the limitations of significance when doing calculations on spreadsheets like Excel are learned. Lecture emphasizes instances where the correct application of an equation, theory, or calculation is to be used and why.

Critical Thinking (CRT)

Critical Thinking Outcome 1

Students will be able to identify key elements of critical thinking, such as habits of distinguishing deductive from inductive modes of inference, recognizing common logical fallacies and cognitive biases, translating ordinary language into formal argument, distinguishing empirical claims about matters of fact from normative or evaluative judgments, and recognizing the ways in which emotional responses can affect reasoning processes. Building on formal teaching in distinguishing the

inductive and deductive parts of the scientific method, students in biochemistry will put these forms of logic to work by developing hypotheses in laboratory write-ups and deducing the conclusions from data in lecture exams. The 421 course will amplify these skills by weekly or daily interrogations about data presented in class or measured in the laboratory. Students will have to describe the questions being tested and deduce from the data the answers to those questions. In several instances, common fallacies and evaluation judgements that can bias conclusions will be taught.

Critical Thinking Outcome 2

Drawing on skills developed in class, students will be able to evaluate the validity of arguments, including their own. How to evaluated and think critically about the validity of their own data in all the laboratory modules, as well as examples from the literature of scientific dogma presented in lectures (and included on examinations) are taught. In particular, students will be taught how to read (from the literature) and create graphs and tables of data, including how that presentation of the arguments provides evidence for supporting or refuting a given hypothesis. In lecture, students will engage in several critical thinking points throughout the semester such as the hyperventilating patient, the sequence analysis puzzle, comparisons regarding structure and function, the interpretation of kinetic data to get modes of inhibition and deducing what that means for enzyme structure and function, as well as the effect of the nano-environments inside of proteins and how these change the chemistry.

Teamwork & Collaboration (TWC)

The teaching and implementation of teamwork and collaboration is key, actually critical, to BOTH semesters of the laboratory. Both semesters will teach the skills of proper teamwork and collaboration, and then allow students to act it out week after week, thus seeing the value in this skill. In the first semester, the basics of 2-3 person teams in constant support in performing the laboratory exercises are taught, performed, and evaluated. This skill is also taught in the first weeks and evaluated as a group at the end of the semester.

Teamwork Outcome 1

As a result of explicit training in teamwork and sustained experiences of collaborating with others, students will be able to identify the characteristics of a well-functioning team. In the first lecture each semester, and the first pre-lab discussion sections, successful teamwork strategies will be taught and emphasized as the only way to get through the laboratory exercises. Aspects of a well-functioning team are described and identified, as well as the lessons teamwork teaches; innovation, leadership development, and fostering knowledge of one's own strengths and appreciation for those of others. In addition, there it's explained that success in the laboratory will rely on effective collaboration with others, most importantly is the sustained interactions with their lab partner. All lab exercises are performed with a lab partner(s). Partners work closely the entire semester in preparation, performance, and analysis. The biochemistry laboratory aims to mimic a real-world situation wherein you have several overlapping objectives that all must be completed in the allotted four hours. This can only be accomplished if there is cooperation. Moreover, there are several exercises that require the cooperation among the pairs, so teams and tasks expand and contract during the semester. During the end of the semester, in the prelab discussion sections, an evaluation of how well the partners and teams worked together and what worked for success and what interfered with success will be included.

Teamwork Outcome 2

Students will demonstrate an ability to use the tools and strategies of working successfully with a diverse group, such as assigning roles and responsibilities, giving and receiving feedback, and engaging in meaningful group reflection that inspires collective ownership of results. How well teams function are assessed on a regular basis, as well as how well everyone functions as a member of that team. Teamwork is learned by performing all data collection and analysis working with a lab partner throughout the semester and with other groups at various points when data comparisons warrant. The ability to work successfully with diverse groups in which everyone may have different roles are integral to the laboratory's function. Final assessment of achieving this teamwork learning outcome, will include submission of both a self-evaluation and team-evaluation to their instructor at the end of the semester. The instructor will consider these evaluations in the context of the team contract when assigning final grades for teamwork, attitude, attendance, safety, and communication, all of which comprises 10% of their lab grade.

HUB Units earned in the Spring:

Teamwork & Collaboration (TWC)

The teaching and implementation of teamwork and collaboration is key, actually critical, to BOTH semesters of the laboratory. Both semesters will teach these skills of proper teamwork and collaboration, and then allow students to act it out week after week, thus seeing the value in this skill. In the second semester, larger groups of teams are brought together in organized efforts to get complementary experiments accomplished. In addition, the group project for the spring semester for solving problems of biosynthesis, metabolism, or enzyme mechanisms will be done in groups of 6-8 students, which will foster working together in an intellectual context outside the laboratory. This skill is also taught in the first weeks and evaluated as a group at the end of the semester.

Teamwork Outcome 1

As a result of explicit training in teamwork and sustained experiences of collaborating with others, students will be able to identify the characteristics of a well-functioning team. In lecture and pre-lab discussion sections, successful teamwork strategies will be taught and emphasized as the only way to get through the laboratory exercises. Aspects of a well-functioning team are described and identified, as well as the lessons teamwork teaches; innovation, leadership development, and fostering knowledge of one's own strengths and appreciation for those of others. In addition, there it's explained that success in the laboratory will rely on effective collaboration with others, most importantly is the sustained interactions with their lab partner. All lab exercises are performed with a lab partner(s). Partners work closely the entire semester in preparation, performance, and analysis. The biochemistry laboratory aims to mimic a real-world situation wherein you have several overlapping objectives that all must be completed in the allotted four hours. This can only be accomplished if there is cooperation. Moreover, there are several exercises that require the cooperation among the pairs, so teams and tasks expand and contract during the semester. During the end of the semester, in the prelab discussion sections, an evaluation of how well the partners and teams worked together and what worked for success and what interfered with success.

Teamwork Outcome 2

Students will demonstrate an ability to use the tools and strategies of working successfully with a diverse group, such as assigning roles and responsibilities, giving and receiving feedback, and engaging in meaningful group reflection that inspires collective ownership of results. Students are assessed on a regular basis on how well they are functioning as a team and as a member of that team. They learn teamwork by performing all data collection and analysis working with a lab partner throughout the semester and with other groups at various points when data comparisons warrant. Students will demonstrate an ability to work successfully with diverse groups in which they may have different roles. Final assessment of achieving this teamwork learning outcome, will include submission of both a self-evaluation and team-evaluation to their instructor at the end of the semester. The instructor will consider these evaluations in the context of the team contract when assigning final grades for teamwork, attitude, attendance, safety, and communication, all of which comprises 10% of their lab grade.

Research Information Literacy (RIL)

The teaching of Research Information Literacy is a year-long process in the biochemistry for majors courses. Throughout the course, the lectures refer to various publicly available biochemical and molecular data bases and analytical resources. At various times, the class is lead to those sites on the Internet, and lessons proceed using them. Moreover, during a continuous laboratory exercise that begins in the fall and finishes in the spring, students get hands-on training in using several of these publicly available databases for asking a basic research question: How do pharmaceutical companies analyze targets for drug development? For this, several hypotheses are posed and students are lead to the information sources to help test these ideas. They finally communicate their findings in the lab write-ups for these two exercise, call bioinformatics exercises.

Research Outcome 1

Students will be able to search for, select, and use a range of publicly available and discipline-specific information sources ethically and strategically to address research questions. This HUB unit is one taught and earned throughout the two-semester course and awarded with successful completion of 422. For teaching literacy in information technology in biochemistry, there are rich and varied collections of data about which students will be introduced in lectures. Furthermore, through constant reference and attribution in the lectures, as well as a purposefully sequenced laboratory exercise for hands on use of many of these information databases in the laboratory sections of both 421 and 422, students will learn of the content and sources of such biochemical information. Furthermore, students will learn how to use primary literature sources to support and report their findings as they write their lab reports.

Research Outcome 2

Students will demonstrate understanding of the overall research process and its component parts, and be able to formulate good research questions or hypotheses, gather and analyze information, and critique, interpret, and communicate findings. Again, throughout the two-semester course, both in lecture and laboratory, students learn the use of these databases as tools in a laboratory setting; learning the quality and analyze the validity of data from many of these informational databases; report and communicate what they know about informational databases in their laboratory write-ups; and apply such information for addressing the problem posed, culminating with a discussion section in the laboratory write up that requires students to formulate a subsequent hypothesis based on their observations, specifically using informational databases as a tool.

Writing Intensive (WIN)

The teaching of scientific writing in several genres is a major thread throughout the laboratory sections of BOTH semesters. Both semesters will teach these writing skills to different degrees in each semester. In the fall semester, the emphasis will be on composing and writing a **proper laboratory notebook**. In the second semester, the emphasis will be on composing and writing **proper tables, figures, and legends** needed for scientific reports, publications, and proposals. These two major skills are taught throughout the two-semester series, but emphasized accordingly. This part of the course is often cited anecdotally from graduates as a key aspect to their attaining employment or admission to their post-graduate endeavors.

Examples of proper scientific writing in lecture, either protocols from notebooks or data from publications, are used in lecture. Moreover, the nature of the laboratory manual guides students from data collection and analysis that begin with "cook-book"-like recipes and data tables, through generation of flow charts and data tables, through conversion of raw data to analyzed data, to extraction of procedures and analysis from the manual and conversation into a properly written protocols in the Notebook and polished presentation of analyzed data in Tables and Figures, with footnotes and legends, respectively, in the write-ups. Written and analyzed data allow students to gauge how well such data to stand on its own and can be understood by the reader without reference to another source like the manual. Each week pre-lab notebook assignments teach the basic skills of writing protocols and flow charts. The end-of-chapter write-ups get progressively more sophisticated teaching how to present raw *versus* analyzed data, then to write a stand-alone figure legend polished for a presentation. Write-ups are due following the completion of the laboratory, but are not due until feedback is received from the prior writeups.

Writing Intensive Outcome 1

Students will be able to craft responsible, considered, and well-structured written arguments, using media and modes of expression appropriate to the situation. Writing is fundamental for communication of scientific discoveries. The assignments in these courses will introduce students to biochemical writing. These assignments will introduce the form and function of formal and informal scientific writing, and allow the honing of skills in this writing style. How to construct a convincing arguments based on data collected will be taught, and all for seeing new ways of evaluating evidence collected in the laboratory.

It is expected that students can already read the primary literature, and recognize the structure and important features common to publications in the primary literature. in biology and chemistry. This course will teach throughout each semester the more informal, but equally valuable, form of scientific intensive writing: keeping a scientific notebook and reporting scientific data.

In the first, the basic tenants and importance of keeping a scientific notebook will be taught. The lab manual is designed to progress from exercises where the procedure and data collection are spelled out explicitly, to exercises wherein the procedures are merely described in essence and the data to be collected is discerned from the questions being asked. Every week, this information in the manual is transposed into a lucid and sound set of procedures for their weekly protocol. This includes assigning roles between them and their partners.

In the second, how to write scientific reports will be taught. Such reports are part of any laboratory presentation, grant proposal, manuscript, or formal presentation in the biochemical sciences. As such the reports required in these courses lay the foundation for all of these genres of scientific writing. Lab reports will teach how to make: a proper figure, with figure legend, a proper Table with footnotes, and a proper conclusion & discussion.

All writing assignments are evaluated each week by the Teaching Fellows, who will give feedback for the following weeks assignments. The final product, as well as the ability to synthesize and improve following feedback, will be assessed. These writing assignments comprise the majority of the points for grading the laboratory, 70% of the lab grade, which is 21% of the final course grade coming from the writing components.

Writing Intensive Outcome 2

Students will be able to read with understanding, engagement, appreciation, and critical judgment. Both genres of writing derived from information in the laboratory manual, literature articles, and information in pre-lab discussion sections to understand and appreciate how to extract such details from these sources and create a logical protocol, flow chart, and/or data table for their notebook and for their reports. This skill is required for any scientist who has to develop protocols suited to their questions and situation derived from previously published literature.

Writing Intensive Outcome 3

Students will be able to write clearly and coherently in a range of genres and styles, integrating graphic and multimedia elements as appropriate. As mentioned above, the two major genres of scientific writing honed by the completion of this course, keeping a scientific notebook and reporting scientific data, require intelligible writting. This importantly includes integration of graphical and tabular data and analysis. Logical and lucid writing of conclusions and opinions deduced from collected data are taught. The graphical presentation of the analyzed data, with proper footnotes and legends, are key elements of what students will learn to write.

Creativity and Innovation (CRI)

The Metabolism Project, allows students to use their considerable knowledge attained after over 5-8 semesters of gaining knowledge in biology and chemistry. Based on the subject matter of the Spring, which is biological energy transfer and metabolism, an explicit project is undertaken that teaches and encourages creativity. The pedagogy of creativity is taught early in the semester in the discussion sections and working in teams of 4-5 students (which also allows students to use and hone skills in teamwork), students devise and write three progressive assignments tackling a problem or disease that involves metabolism.

Creativity Outcome 1

Students will demonstrate understanding of creativity as a learnable, iterative process of imagining new possibilities that involves risk-taking, use of multiple strategies, and reconceiving in response to feedback, and will be able to identify individual and institutional factors that promote and inhibit creativity. This two-semester course will accomplish the goals in Creativity and Innovation in three manners. The first will be through a thorough grounding in the principles governing the underlying chemistry and physics of biological systems. Without these tools and information, there is no palate or foundation for

thinking creatively in biochemistry. These principles are the focus of 421 wherein all four major classes of biological macromolecules and complexes are described and explained. In addition, this information is integrated with the laboratory wherein students learn how to measure and manipulate these molecules. The second, the students will learn the basic principles involved as well as the major pathways for energy production and utilization in the lectures in 422, as well as the details of enzyme mechanisms through examples. In the integrated laboratory section in 422, students will participate in an iterative process of inquiry as they learn in more detail the intricacies of the enzyme's active site and the structure of the plasma membrane. Moreover, throughout lectures in both semesters multiple stories are told embodying examples of the creative process, including deciphering the structure of the alpha helix of proteins, the double helix of DNA, the sequence of proteins, the ATP synthesis via chemiosmosis, membrane structure, etc. The third and most critical component of learning Creativity and Innovation is a distinct project, The Metabolism Project, wherein students will participate in the creative process themselves using the information they have from the underlying chemistry and physics of biological systems and from the metabolic pathways to propose a solution to proposed problems of biosynthesis, metabolism, or enzyme mechanisms. Students will discuss and brainstorm solutions to metabolic disease or metabolism use in a creative open-ended project to solve some problem involving metabolism. The first assignment is to brainstorm a number of possible projects. Feedback on which lends itself to the most creativity and limiting overlap with other projects in the class is provided. The second assignment involves devising a new or creative modification in a method for diagnosis of a metabolism disease of outcome of some metabolism. Feedback is provided on scholarship and the degree of creativity. The third and final assignment is to submit a creative summary of some treatment of a metabolic disease or some other use of metabolism.

Creativity Outcome 2

Students will be able to exercise their own potential for engaging in creative activity by conceiving and executing original work either alone or as part of a team. The Metabolism Project allows students to use their own creative ideas based on their own interests and background. Then as part of a team, and including feedback, a creative proposal for a solution involving metabolism is composed. Students will work in groups of 4-6 with group discussions helping to advance the project. A preliminary proposal is turned in wherein feedback would be on the soundness and feasibility and be sent back for refinement or re-thinking. In this iterative fashion, pathways leading to dead ends can be eliminated. Students are encouraged to undertake targets that are not well understood, but which build on the knowledge they've accumulated over the two semesters of biochemistry. The delivery of the final assignment can take the form of a written report, a slide show, a poster or other work of art (but well annotated), or a video.

Biochemistry I Lecture & Lab Schedule

BB 421/621 – Section A1

Fall 2025 *(version 3)*

Staff	Phone	Office	E-mail	Office Hours
Dr. Dean R. Tolan (A1 Professor)	3-5310	Rm 704, 24 Cummington (LSE)	tolan@bu.edu	T 11:00-11:50, W 12:20-1:10, and F 2:00-3:30 (only weeks before exams), or by arrangement
Dr. Pinghua Liu (A2 Professor)		SCI-453, 590 Commonwealth (SCI)	pinghua@bu.edu	T 6:00-7:00, F 5:30-6:30, or by arrangement
Dr. Blair Szymczyna (Lab Coordinator)		SCI-452	bszymcz@bu.edu	T 5:15-6:15, W 5:30-6:30, and R 12:00-1:00
Teaching Fellows:				
Christina Alcaro		SCI-161	cnalcaro@bu.edu	R 1:00 pm - 2:00 pm
Haley Curtis		SCI-161	hcurtis@bu.edu	W 1:00 pm - 2:00 pm
Xufeng (Francis) Fang		SCI-161	fangxf@bu.edu	R 3:00 pm - 4:00 pm
Takumi Hawes		SCI-161	thawes@bu.edu	M 5:30 pm - 6:30 pm
Dr. Jackson Ho		SCI-161	jvho3@bu.edu	F 12:00 pm - 1:00 pm
Kristin Hughes		SCI-161	kxhughes@bu.edu	F 11:00 am - 12:00 pm
Patryk Kalinowski		SCI-344	patryk@bu.edu	W 12:00 pm - 1:00 pm
Chenxi Liu		SCI-161	lcx@bu.edu	R 2:00 pm - 3:00 pm
Favian Liu		SCI-161	faliu@bu.edu	M 3:30 pm - 4:30 pm
Emma Mortara		SCI-161	emortara@bu.edu	M 12:30 pm - 1:30 pm
Daniel Nartey		SCI-161	dnartey@bu.edu	R 5:30 pm - 6:30 pm
Yinze Wu		SCI-296	yinzewu@bu.edu	T 6:15 pm - 7:15 pm

Sections	Times	Places
Lecture	**M 8:00 AM; W 9:05 AM; & F 9:05 AM (all end at 9:55 AM) (A1)**	**CAS 224**
Pre-lab Disc.	**T 12:30-1:45 PM (C1)**	**SCI 109**
	T 2:00-3:15 PM (C2)	**COM 101**
Laboratory	**W 8:00, 1:25 & 6:30 (B1, B2, B3); R 8:00, 1:25 & 6:30 (B4, B5, B6);**	
	F 8:00, 1:25 & 6:30 (B7, B8, B9); M 10:10 & 3:35 (BA, BB)	**SCI 162**
621 Discussion (Grad students)	**TBA**	**TBA**

Day-Date	*Lecture #	Topic	Reading in Lehninger	Homework**	Laboratory
M-Sept 1		**HOLIDAY** – *Labor Day*			
T-Sept 2		**Pre-lab Discussions - MUST ATTEND!!!!**			*Discussions begin*
W-Sept 3	**0**	Organization & Introduction	Ch1, 1-3, 10-12		
F-Sept 5	**1**	- Introduction, thermodynamics	Ch1, 6-9, 13-14, 19-25		
			Ch13, 466-469	**1**	
M-Sept 8	**2**	- Water & Hydrogen Bonds	Ch2, 43		
		- Molecular Forces	Ch2, 43-53	**2**	
		- pH	Ch2, 53-64	**3**	
W-Sept 10	**3**	- Proteins; Introduction	Ch3, 70		*LAB STARTS/Lab 1 (Intro)*
			Ch1, 13-19		
			Ch4, 106-107	**4**	
R-Sept 11		*– National Patriot Day*			
F-Sept 12	**4**	- Amino Acids I-structure & properties	Ch3, 70-76		
M-Sept 15	**5**	- Amino Acids II pH	Ch3, 76-82; 87-89		
		- Amino Acids III pI	Ch2	**5**	
‡*ADD deadline*		*DUE: Molecular Biology Review*	*Ch1,28-30; Ch8,263-271; Ch27,1006-1009*		
W-Sept 17	**6**	- Protein Purification	Ch3, 83-87, 89-90	**6**	*Lab 2 (Crude extract)*
			Ch1, Fig 1-7		
			Ch9, 313-314		
F-Sept 19		***- Review Session***		**Q1-3**	
M-Sept 22		**HOUR EXAM I** (8:00-10:00 AM at TBA) [Lectures 1-6] **(8)**			
W-Sept 24	**7**	- Protein Structure I: Primary Structure (1°)	Ch3, Fig 3-23	**7**	*Lab 3 (Chromatography)*
			Ch4, 106-110		
F-Sept 26	**8**	- Protein Structure II: Determination of 1°	Ch3, 90-93, Box 3-2	**8**	
M- Sept 29	**9**	- Protein Structure III: 2° the α-helix	Ch4, 119-122,125-127,131-133	**9**	
		- Protein Structure IV: 2° the β-sheet;	Ch4, 114-115,120-121,123-124		
W- Oct 1	**10**	- Protein Structure V: 3° & 4°	Ch4, 116-117,126-128	**10**	*Lab 4 (Assays)*
F- Oct 3	**11**	- Protein Structure VI: Characterization of Proteins; Determination of 2°, 3°, 4°	Ch4, 116, 138-142	**11**	
M-Oct 6	**12**	- Protein Structure VII: Collagen	Ch4, 118-120		
		- Enzymes I; intro., binding & catalysis;	Ch1, 25-27		
			Ch5, 147-148, 150-152, 157	**12**	
‡*DROP deadline*			Ch6, 177, 209-210		
W-Oct 8	**13**	- Enzymes II; enzyme nomenclature;	Ch6, 178-179		*Lab 5 (SDS-PAGE)*
		mechanism nomenclature (Cleland)	Ch6, 194-195		
		transition-state theory, catalytic strategies	Ch6, 179-181,184-185		
		mechanistic strategies	Ch6, 186-188		
F-Oct 10		***- Review Session***		**Q4-6**	
M-Oct 13		**HOLIDAY** – *Columbus Day*			

T-Oct 14(Mon Sched)		**HOUR EXAM II** (8:00-10:00 AM at TBA) [Lectures 7-13] **(9)**			
W-Oct 15	14	- Enzymes III; Steady-state kinetics; Data analysis;	Ch6, 188-195	**13, 14**	*Lab 6 (Modeling)*
F-Oct 17	15	- Enzymes IV; Inhibition	Ch6, 191, 197-200	**15**	
M-Oct 20	16	- Enzymes V; Active site; Energetics	Ch6, 181-186, 195-196	**16**	
		- Enzymes VI; Mechanism - chymotrypsin	Ch6, 203-208	**17**	
W-Oct 22	17	- Enzymes VII; Regulation - Allostery I	Ch5, 157 Ch12, 413-415		*Lab 7 (Kinetics)*
F-Oct 24	18	- Enzymes VIII; Regulation –Allostery II	Ch5, 157-160 Ch6, 213-220	**18**	
M- Oct 27	19	- Enzymes IX; Regulation – "Hemoglobin"	Ch5, 148-149,152-157,160-164	**19**	
W- Oct 29	20	- Protein Structure VIII: Stability, folding & dynamics	Ch4, 128-136	**20**	*Lab 8 (Gel filtration)*
F- Oct 31		***- Review Session***		**Q7-10**	
M-Nov 3		**HOUR EXAM III** (8:00-10:00 AM at TBA) [Lectures 14-20] **(9)**			
W-Nov 5	21	- Carbohydrates I; - Introduction	Ch7, 229-235		*Lab 9 (Native gels)*
F-Nov 7	22	- Carbohydrates II; - Mono/Oligosaccharides	Ch7, 236-241		
‡ *W/(P-F) deadline*					
M-Nov 10	23	- Carbohydrates III; - Mono/Oligosaccharides	Ch7, 251-254,258-260	**21**	
		- Carbohydrates IV; - Polysaccharides	Ch7, 241-250	**22**	
T-Nov 11		- *Veteran's Day*			
W-Nov 12	24	- Nucleic Acids I; - Introduction	Ch8, 294-296,263-269 Ch24, 885-890	**23**	*Lab Skills Test*
F-Nov 14	25	- Nucleic Acids II; - Shape	Ch8, 269-274 Ch24, 891-894	**24**	
M-Nov 17	26	- Nucleic Acids III; - Stability	Ch8, 278-283 Ch24, 895-897	**25**	
		- Nucleic Acids IV; -Using the Central Dogma	Ch9, 301-313, 326-327	**26**	
		- Recombinant DNA in biochemistry	Ch8, 283-286		
W-Nov 19	27	- Nucleic Acids V; - Replication	Ch25, 916-921	**27**	*NO LABS*
F- Nov 21		***- Review Session***		**Q13-15**	
M-Nov 24		**HOUR EXAM IV** (8:00-10:00 AM at TBA) [Lectures 21-27] **(9)**			
W–Sun- Nov 26–30		**HOLIDAY – FALL BREAK –** *Happy Thanksgiving*			*NO LABS (Fall Break)*
M-Dec 1	28	- Nucleic Acids VI; - Transcription & Genetic Code	Ch26, 960-964 Ch27, 1006-1013, 1018-1024	**28** **29**	
		- Nucleic Acids VII; - Translation	Ch27, 1015-1018, 1028-1036	**30**	
W-Dec 3	29	- Lipids & Membranes I; - Introduction	Ch10, 341-348	**31**	*NO LABS*
F-Dec 5	30	- Lipids & Membranes II; - Membrane lipids Bilayers	Ch10, 352-354, 356 Ch11, 367-369		
M-Dec 8	31	- Lipids & Membranes III; Membranes & Membrane proteins	Ch11, 370-381	**32**	
		- Vitamins & Coenzymes	Ch4,6,8,10,14,16,17,18; 118-119, 178,295,356-359,530-531,534-535,576, 590,613-615,629,641-643 Ch 10, 356-360 Ch17, 613-615	**33**	
W-Dec 10	32	- Metabolism; Introduction & Bioenergetics	Ch1, 4-5 Ch13, 465-471,479-485	**34**	*Last Day of Classes*
R-Dec 12		***-Review Session*** **Old questions TBA**		**Q11-12/Q16-20**	
Mon-Dec 14		***- Review Session*** **TBA**			
Wed-Dec 17		**FINAL EXAM** (8:00–11:00 AM at TBA) [Lectures 28-32(54%) plus Cummulative (46%)] **(7)**			

*Lecture numbers; underlined numbers are 2-hour-Monday lectures. **Homework assignment number in *Achieve* (5-10 questions each); Due Sunday nights, no exceptions. ‡Last day to ADD (9/15), DROP without a 'W' (10/6), or WITHDRAW with a 'W' (11/7).

Prerequisites: Students are **REQUIRED** to have passed (≥C) 2 semesters of organic chemistry with labs (CH 204, 214, or 212).

Textbooks (all are available at the BU Bookstore and/or through the FirstDay link in Blackboard):

1) "Lehninger's Principles of Biochemistry 8th edition" by Nelson, Cox, and Hoskins.
2) "Biochemistry Laboratory Manual, 6th Edition" by Dean R. Tolan, Jose L. Medrano & Wen Yi Low
3) Achieve Website

Grading:

421; Lab 30%, Homework 8%, Pre-requisite Quiz 2%, Best 3 of 4 hour exams 36%, Final 24%
621; Lab 25%, Homework 8%, Pre-requisite Quiz 2%, Best 3 of 4 hour exams 30%, Paper/Discussion 15%; Final 20%
Attendance and meeting deadlines of all dates listed above are required. There will be no make-up exams except as allowed by the policy outlined in the **Syllabus: Policies**.
For Lab; lab write-ups turned in late will have points deducted (see **Syllabus: Policies**, and Lab Syllabus, and on the lab Blackboard site).

Biochemistry-A1 Home Page: **http://www.bu.edu/aldolase/biochemistry**

Biochemistry-A2 Home Page: http://learn.bu.edu/

Biochemistry-LAB Home Page: http://learn.bu.edu/

GENERAL EDUCATION CREDIT (HUB Units): Completion of the course will earn HUB units in Quantitative Reasoning 2 (QR2), Critical Thinking (CRT), and Teamwork and Collaboration (TWC)

Academic Conduct: The Boston University rules and regulations described in the College of Arts and Sciences Academic Conduct Code will be strictly enforced. In particular, this applies to the writing of lab reports. Sharing of data and discussion is encouraged, but **all** written material, including graphs and tables, must be from your own hand. Web site: http://www.bu.edu/academics/policies/academic-conduct-code/