Chemistry 256: Biochemistry

Spring 2020

Course Description

This course is a study of the structure and function of biological molecules. The course focuses on the chemistry of core metabolic processes including: carbohydrate metabolism, the citric acid cycle, and oxidative phosphorylation. The format of the course will include a variety of evidence-based student-centered, high impact teaching practices, which have been shown to lead to improved learning outcomes for all students. This is not a lecture-only course.

Expectations

From the class – Biochemistry is an ever changing field and is impossible to summarize in a one-semester course. You can expect to be introduced to the fundamentals of the field and be immersed in carbohydrate metabolism, the citric acid cycle, and oxidative phosphorylation. Despite being a content heavy course, you can expect to learn how this content relates to broader concepts within the fields of biology and chemistry. To guide the course format, assignments, and content, the instructor has developed a list of learning objectives from the College, the Department, and the American Society for Biochemistry and Molecular Biology. Details of how these learning objectives map to assessment can be found at the end of this syllabus and on the course Moodle page.

From the instructor – to arrive to class early and prepared for class, return graded and assessed items in a timely manner, reply to emails in a timely manner, treat each person with respect, be available outside of class for questions or further discussion, and help you come to appreciate the complexity and beauty of our biochemical world.

Of the students – to be on time (when arriving to class, turning in assignments, etc.), prepared for class (reading and homework completed, ready to participate in class, etc.), respect others, notify the instructor of absences, and participate in class as both an active listener and as a participant.

Instructor and Resources

Instructor: Dr. Kerry Rouhier (pronounced "Roo-yer")
Email: rouhierk@kenyon.edu
Office: 212 Tomisch Hall
Office Hours: M 1:00-3:00PM, T 4:00-5:00PM, F 2:00-3:00PM or by appointment
Class Location: Tomsich 101
Class time: 10:10-11:00 AM, MWF
Course materials: Lehninger Principles of Biochemistry 6th Edition, study guide (optional), bound notebook, calculator
Website: moodle.kenyon.edu

Course Information

Accessibilities Accommodations – A student with a disability who thinks they may need an accommodation to access a campus program, activity, or service should contact Erin Salva in Student Accessibility and Support Services (SASS) at salvae@kenyon.edu to discuss specific needs. Advance notice is required to review documentation, evaluate accommodation requests and provide notice or arrangements for any accommodation.

Academic Integrity – Kenyon College is, at the core, an intellectual community of scholars – students and faculty – engaged in the free and open exchange of ideas. Critical to this lively exchange and deep engagement with ideas is the academic integrity of our work, both inside and outside the classroom.

At Kenyon we expect all students, at all times, to submit work that represents these standards of academic integrity. It is the responsibility of each student to learn and practice the proper ways of documenting and acknowledging those ideas and words you have drawn upon (see Academic Honesty and Questions of Plagiarism in the Course Catalog). Ignorance and carelessness are not excuses for academic dishonesty. Students will be working in teams to meet many of the learning goals for this class. In all cases, your work must be your own. If you are uncertain about the expectations for academic honesty in this class, please ask for clarification.

Attendance – Your attendance at every class is expected. As this is a student-centered course simply getting the notes from someone in class will not be sufficient for meeting the learning goals of this course. However, I recognize that there will be times when you will need to miss class. Please use your best judgement and if you need to miss class, notify me *before* your absence via email. The instructor reserves the right to expel students from this course for excessive unexcused absences. Excused absences include interviews, athletic events,

Course format and rationale - I really want you to be successful in this class and I would love it if that by the end of the class, you were also really excited about the field of biochemistry. Therefore the structure of this class includes a variety of inclusive teaching practices. This will include think-pair-share, small group work, peer teaching, case studies, reflective writing, collaborative work, low-stakes quizzing, etc. Additionally, you should know that the material for this course builds on itself so it is imperative that you stay current with the reading material and associated homework (which could include watching videos). To help guide your learning and understanding of the material covered in this class, I included a tentative schedule in the syllabus and posted to Moodle a "Study guide and Learning Goals" document that includes suggested end of chapter exercises, chapter outlines, and links to additional resources.

Office hours - As you know office hours are often the perfect setting for getting clarification on course material. Often this clarification comes more easily when small groups of students attend office hours together, so therefore I encourage you to visit office hours frequently and in small groups when possible. Office hours are also a great opportunity to discuss career plans, research opportunities, or simply destress by petting Lewis.

Responsibility – As members of the Kenyon College Faculty, I am concerned about the well-being and development of my students and am available to discuss any concerns. However, I want you to know that faculty members are legally obligated to share certain information with the College's Title IX coordinator. This is to ensure the student's safety and welfare is being addressed, consistent with the requirements of the law. These disclosures include, but are not limited to, reports of sexual assault, relational/domestic violence, and stalking.

Technology Use – It is my preference that you refrain from using a laptop during class. Data shows that the use of laptops in class can hinder learning for users and nearby peers[1]. If you must use a laptop or similar device for this class, please see the instructor during the first week of classes. Most of the time there will be no need to access your cell phone during class, therefore please have them turned off or set to silent. Occasionally, you will be asked to use your cell phone or electronic device for polled questions.

[1] https://doi.org/10.1016/j.compedu.2012.10.003

Class Requirements and Grading Standards

Your grade for this course will be based on:

A. In-class assignments 20%
B. Homework 20%
C. Weekly quizzes 10%
D. Mid-term exams 25%
E. Final exam 15%
F. Special topic project 5%
G. Seminar synopses 5%

The instructor will assign fair grades at the conclusion of the term. To estimate your grade during the semester use the following grade scheme:

Grade	% total points earned
A (+/-)	100-90%
B (+/-)	89-80%
C (+/-)	79-70%
D (+/-)	69-60%
F	< 60 %

A. In-class assignments -
   Students will be working individually or in teams to complete in-class assignments during most class meetings. These guided activities will give students the opportunity to discuss, practice, and test their knowledge of course material. The format of these assignments will vary depending on the topic, but will include the use of case studies, primary literature, POGIL, and other active learning assignments.
B. Homework -
   There will be two parts to every homework assignment. One part will be an extension of the material covered in previous classes. The second part will help prepare students for the next class meeting by watching videos or reading sections of the textbook (or related material) and answering associated questions. Students must complete their homework assignments in their notebooks and upload pictures of completed work to Moodle. The instructor will then use student responses to guide class discussions. Students may work with others to complete their homework, however all work must be your own.
C. Weekly quizzes -
   There will be 10 weekly quizzes during the semester. The quizzes will be on Wednesday starting promptly at 10:10 am and last 5-10 minutes. They will cover material discussed since the previous quiz. There will be no makeup quizzes; however, your lowest quiz grade will be replaced by your highest at the end of the semester. Quizzes will be graded in-class immediately following its completion.
D. Mid-term exams -
   There will be 3 fifty-minute exams during the semester. If you have a scheduling conflict, please notify the instructor by email at least one week prior to the scheduled exam to set up an alternate exam time. Each exam will include an exam-wrapper. The exam wrapper is used to help students think more deeply about their preparation and performance in order to help them improve for the next exam.
E. Final exam -
   The final exam will be Tuesday, May 5th, 1:30 PM. It will be cumulative for the semester and students will have two hours to complete it.
F. Special topic project -
   Students will be creating an infographic based on a professional career related to chemistry or biochemistry. Details about this assignment are provided on the course Moodle page. Infographics will be posted in the halls of Tomsich.
G. Seminar synopses -
   Students will need to attend and write about two seminars. These one-page synopses should include a summary of the information presented in the seminar and how it relates to what we are studying in this class. Be sure to include your name, the title of the seminar, the presenter, and the date of the presentation at the top of the synopsis. Synopses must be turned in within 48 hr following the seminar presentation.

Tentative Schedule

	Date	Topic	Associated text
1	1/13	Introduction to CHEM 256	(1.1-1.5)
	1/15	Introduction to Biochemistry	2.1-2.3 (2.4-2.5)
	1/17	Macromolecules	3.1, 3.2, 3.4
2	1/20		
	1/22		
	1/24	Folding	4.1-4.4
3	1/27		
	1/29	Function - Introduction to proteins	5.1-5.3
	1/31		
4	2/3		
	2/5		
	2/7	Function - Introduction to reactions	6.1-6.2
5	2/10		
	2/12	Exam I	
	2/14	Function - Introduction to enzymes	6.3-6.5
6	2/17		
	2/19		
	2/21	Pathways - Introduction to reactions	13.1-13.3
7	2/24		
	2/26		
	2/28	~~Macro~~molecules	7.1-7.2 (7.3-7.5)
	3/2-3/13	Spring Break!!	
8	3/16	Pathways - Glycolysis, Gluconeogenesis, and Regulation	14.1-14.4 & 15.1-15.3
	3/18		
	3/20		
9	3/23		
	3/25	Exam II	
	3/27	Pathways - Glycolysis, Gluconeogenesis, and Regulation	14.1-14.4 & 15.1-15.3
10	3/30		
	4/1		
	4/3		
11	4/6		
	4/8	Pathways - Pentose Phosphate Pathway	14.5
	4/10	Pathways - TCA Cycle	16.1-16.3
12	4/13		
	4/15		
	4/17	Pathways - Oxidative Phosphorylation	19.1-19.3 & 13.4
13	4/20		
	4/22	Exam III	

	4/24	Pathways - Oxidative Phosphorylation	19.1-19.3 &13.4
14	4/27	Pathways - Specialized metabolism	
	4/29		
	5/1		
	5/5	Final Exam @ 1:30 PM- Cumulative in TOM 101	

Above schedule is subject to change pending notification verbally or via email list.

Learning Goals

General Course Goals

1. Metacognitive Skill Development – Students will learn how to evaluate concepts, material, problems, and challenges posed in the class and thoughtfully apply appropriate and efficient techniques to meet the needs of a given situation.
2. Individual and Collaborative Efficacy – Students will develop skills to effectively solve problems individually and as a member of a team. Students will take responsibility for their own success and seek help and resources appropriately. Due to the collaborative nature of this course, students will also take responsibility for helping to create an environment so that others in the class can learn successfully.
3. Communication – Students will develop oral, written, and symbolic communication skills. Communication between peers, with the instructor, and to the class as a whole all represent different and important settings to exercise professional communication skills.
4. Engagement with Scientific Information – Scientists continue to learn and develop skills throughout their career. Acquisition of information and skill development occurs in a variety of settings using a diversity of information sources including: the professional literature, scholarly texts, technical online resources, seminars, workshops, team members, and professional superiors. Students will develop their ability to make use of all of these information sources to advance their own learning and skills.

American Society for Biochemistry and Molecular Biology

The American Society for Biochemistry and Molecular Biology (ASBMB) developed a set of concept-driven learning objectives as guides for all Biochemistry and Molecular Biology programs. The content-specific learning goals of this course are based on those suggested by the ASBMB and can be found in the document titled "Study Guide and Learning Goals" found on the course Moodle page. Content and material covered in CHEM 256 addresses many learning goals under the themes of Energy, Structure & Function, and Evolution & Homeostasis. The complete concept inventory can be found on the course Moodle page. If you would like to learn more about ASBMB's concept-driven teaching, visit: http://www.asbmb.org/education/teachingstrategies/

Kenyon College and Chemistry Department

Kenyon is institutionally committed to promoting a liberal arts education and as such has outlined the learning goals for your college-wide education that promoted and developed skills that are useful to any career but also essential for a fulfilling and valuable life. In addition, the community of students and faculty in the Chemistry Department are dedicated to achieving skills interlaced with the chemical world. The learning goals of this course are grounded in those suggested by both the college and the department. Only the learning goals met in this course are listed below. If you would like to learn more about Kenyon's learning objectives or the Chemistry Department's learning objectives, visit:
https://www.kenyon.edu/directories/offices-services/registrar/course-catalog-2/administrative-matters/kenyon-college-its-mission-and-goals/ or
https://www.kenyon.edu/directories/offices-services/office-of-the-provost/faculty-resources-information/department-mission-statements-and-assessment-plans/chemistry/

Chemistry Department Goals:

Learning Goal/Objective	Learning Assessment	Details
1. Each student should learn sufficient chemistry to serve them well in life after Kenyon.	Homework, in-class assignments	Students will learn biochemistry content that has been identified by the American Society of Biochemistry and Molecular Biology through in-class work and homework.
2. Each student should learn to write well by being required to answer essay exam questions, write term papers, problem set answer sheets, laboratory and research reports, all critically evaluated by faculty.	Special topic project, exams	While there will be many opportunities for students to demonstrate their competency for this goal, it is for the poster presentation and the exams for which it will be critically evaluated with feedback given.
4. Each student become skilled at formulating and solving problems, both qualitative and quantitative, through the working of problem sets and exam questions and by engagement with laboratory and research projects.	Homework, in-class work, quizzes, exams	Students will have opportunities to practice and assess their acquisition of qualitative and quantitative skills through homework, in-class assignments, quizzes, and exams.
5. Each student should learn to access, evaluate and use information from computerized information sources.	Special topic project, in-class work	Students will be asked to use bioinformatic data and primary literature to access, evaluate, and use information to complete assignments and acquire information for the poster presentation

College Goals:

Learning Goal/Objective	Learning Assessment	Details
b) Students learn gather information from a variety of sources and evaluate its quality.	Special topic project	In the acquisition of information for the presentation, students will need to evaluate its quality so that all data/information presented is of the highest quality and is appropriate for the topic presented.
c) Students learn to formulate ideas rigorously and communicate them effectively, in speaking and in writing.	Homework, in-class work, synopses, quizzes, special topic project	Communication of scientific information through both speaking and writing will be assessed through short writing assignments (homework, in-class work, quizzes), longer writing assignments (synopses), and by speaking (in-class work, poster presentation).
f) Students acquire quantitative skills and analyze data.	Homework, in-class work, exams, special topic project	Students will have opportunities to practice and assess their acquisition of quantitative skills through homework and in-class assignments. Additionally, students will have opportunities to analyze quantitative data through homework, in-class work, and for the poster presentation.
i) Students learn to work collaboratively and across disciplines.	In-class work, special topic project	Students will be working in teams to complete in-class work and for the presentation and therefore, must learn to work collaboratively, regardless of training or background to successfully complete the assignment.