

## BB 490/590 Biochemistry—Structure and Function

**Course Description.** BB490/590 is the first term of a three-quarter introductory sequence in biochemistry, designed for undergraduate majors and beginning graduate students. Emphasis is on structure and function of biological molecules, principles and mechanisms of enzyme action, and introduction to intermediary metabolism. BB 491/591 (Winter Quarter) emphasizes intermediary metabolism, and BB 492/592 (Spring Quarter) focuses on genetic biochemistry.

**Instructor:** Dr. Christopher K. Mathews

**Office:** 2047 Agricultural and Life Sciences Building

**Office Hours:** Monday to Thursday 1:00–3:00, but flexible. Call or e-mail to check availability or take a chance and drop in. **Contact:** mathewsc@onid.orst.edu or phone 71865 (541-737-1865)

**Teaching Assistants:** Nurhayati Wolfenden (wolfendn@onid.orst.edu) and Kelsey Caples (caplesk@onid.orst.edu)

**TA Office Hours** (held in ALS 2162, Undergrad BB lounge): Kelsey, MW 11:00–12:30; Hayati, TTh 11:30–1:00

**Course Prerequisites:** CH332 or 336 or equivalent.

### Learning Resources

1. Textbook: *Biochemistry*, 4th Edition, by Mathews, van Holde, Appling, and Anthony-Cahill (2013)
2. Lectures: MWF 10–10:50 in Owen 102
3. Lecture notes posted on Blackboard (**BB490\_X001\_F2015** for both 490 and 590)
4. Study Guides posted on Blackboard
5. Solutions to problems in textbook posted on Blackboard
6. TA and instructor office hours

Students are strongly advised to review lecture notes and suggested textbook reading before presentation of the relevant topics in class.

**Evaluation:** Grading will be based upon two non-cumulative midterm exams (100 points each), a cumulative final exam (200 points), and performance on in-class problem solving (100 points). Grades will be determined from distribution of scores for the entire class. Separate distributions will be prepared for BB490 and BB590. Grades will be distributed and assigned separately for students enrolled for graduate credit (BB590).

**In-class problem-solving.** About once per week (see dates in class schedule) the lecture will end about 20 minutes before the end of class time. The instructor will assign a problem based upon material being presented in class at that time. Students may work on each problem individually or in groups. Any resources may be used—textbook, class notes, calculator, Wikipedia. Each student must turn in a paper at the end of the

class period, whether or not there is a complete answer. The top seven scores among the nine problems assigned during the quarter will be used to determine the point total for the course (14 points possible each problem; 14 x 7 plus 2-point bonus = 100).

Corrected Problems and Exam papers will be available in the BB Office (2011 ALS) from 1:00 to 4:00 PM on Mondays, Wednesdays, and Thursdays.

### Class Schedule 2015

Note. The textbook page references are accurate, but the amounts of class time devoted to each chapter are tentative.

<u>Date</u>	<u>Topic</u>	<u>Chapter in Mathews et al</u>	<u>Pages covered</u>
Sept. 25	Introduction	1	2–20
Sept. 28	The Matrix of Life; Water	2	26–51
Sept. 30	The Matrix of Life; TOB* 2A	2	54–57
Oct. 2	The Energetics of Life PROBLEM 1 (Chapter 2)	3	58–85
Oct. 5	The Energetics of Life	3	
Oct. 7	Nucleic Acids	4	90–122
Oct. 9	Nucleic Acids PROBLEM 2 (Chapter 3)	4	
Oct. 12	Nucleic Acids; TOB 4B	4	129–135
Oct. 14	Proteins, Primary Structure	5	136–158
Oct. 16	Proteins, Primary Structure PROBLEM 3 (Chapter 4)	5	
Oct. 19	MID-TERM EXAM I	Chapters 1–4	
Oct. 21	Proteins, TOB 5A, 5D	5	161–176
Oct. 23	Proteins, 3-D Structure	6	177–215
Oct. 26	Proteins, 3-D Structure PROBLEM 4 (Chapter 5)	6	
Oct. 28	Protein Function/Evolution	7	234–266
Oct. 30	Protein Function/Evolution	7	
Nov. 2	Protein Function/Evolution, TOB 7A PROBLEM 5 (Chapters 6,7)	7	266–276; 282–284
Nov. 4	Carbohydrates	9	309–345
Nov. 6	Carbohydrates	9	
Nov. 9	Lipids and Membranes PROBLEM 6 (Chapter 9)	10	359–396

Nov. 11	VETERANS DAY HOLIDAY		
Nov. 13	Lipids and Membranes	10	
Nov. 16	MID-TERM EXAM II	Chapters 5–7,9	
Nov. 18	Enzymes	11	410–463
Nov. 20	Enzymes PROBLEM 7 (Chapter 10)	11	
Nov. 23	Enzymes, TOB 11A, 11B	11	468–474
Nov. 25	Introduction to Metabolism	12	475–506
Nov. 27	THANKSGIVING HOLIDAY		
Nov. 30	Introduction to Metabolism PROBLEM 8 (Chapter 11)	12	468–474
Dec. 2	Carbohydrate Metabolism	13	518–567
Dec. 4	Carbohydrate Metabolism PROBLEM 9 (Chapter 12)	13	
<b>Dec. 10</b>	<b>Final Examination, 6:00 PM</b>		<b>OWEN 102</b>

\* TOB, Tools of Biochemistry

**Examinations.** Exams will be closed-book, but calculators are allowed. Exam questions will be a mixture of short-answer, problem-solving, and objective questions. Few if any of the questions can be answered only as a result of memorization.

Makeup examinations will rarely if ever be given. Because preparing an exam is labor-intensive, permission to take a makeup will be granted only for a compelling reason and only if a request has been made to the instructor in advance of the scheduled exam time.

It is important that exam grading be fair and perceived as fair. Any requests for regrading an exam question should be presented to the instructor in writing, within three days after the exam papers have been returned to the class. The instructor reserves the right to regrade the entire exam if he perceives that the original grading was too lenient.

**Registration deadlines and Incomplete grades.** The deadline for dropping a course (no grade) is the end of the second week of the quarter. The deadline for withdrawing (W grade) is the end of the seventh week of the term. If you do not withdraw by Friday of the seventh week of class, you will receive a grade in the course.

University policies regarding Incomplete grades are described here. A student may request that an incomplete (for a course that has not been completed) be granted by an instructor, if the reasons for the incomplete are acceptable to the instructor, and so long as the student is passing the course at the time the request was made. At the time an agreement is made to issue an incomplete the instructor and student will complete a Contract for Completion of I Grade to

define the terms under which the incomplete will be completed.

The incomplete that is filed by the instructor at the end of the term must include an alternate/default grade to which the incomplete grade defaults, if the student does not make an effort to resolve the incomplete course work within one year of recording the incomplete. Examples of the new incomplete grades are (I/A, I/A-, I/B+, I/B, I/B-, I/C+, I/C, I/C-, I/D+, I/D, I/D-, I/F, I/P, and I/N).

Satisfactory/Unsatisfactory (S/U) grade options are converted after the submission of the "I/Alternate Grade" is determined by the instructor. For example, if the student has requested an incomplete and has opted for an S/U grade, the instructor will submit an "I/Normal Grade" (e.g., I/B+) at the end of the term. The Office of the Registrar will subsequently convert the "I/Normal Grade" to an "I/S" or "I/U" in accordance with the grading option chosen by the student.

The calculation of the Alternate/Default Grade is determined by the work to be completed for the course over the entire term. For example, while a student may be passing at the time the incomplete request is granted, the Alternate/Default Grade is **NOT** what the student has earned up to the point of the incomplete request. The Alternate/Default Grade is what grade the student would have earned if the instructor includes what was completed and if the student did no more work from the point of the incomplete request to the end of the term.

**Learner Outcomes.** The intention of this course is for students to:

1. Acquire the technical language used to communicate biochemistry information
2. Recall key elements of basic biochemistry principles, including some metabolic pathways, names and structures of biological molecules as presented in class, control mechanisms, mechanisms of enzyme action, and terms to describe categories of molecules
3. Solve quantitative problems related to pH and buffering, bioenergetics, enzyme kinetics, oxidation-reduction reactions, and allosteric regulation
4. Communicate through writing key concepts relevant to biochemistry
5. Understand and apply general concepts of biochemistry to relevant, specific problems
6. Predict the directions of metabolic reactions and pathways from an understanding of the control mechanisms and energy considerations of each

**Learner Expectations**

1. Advance preparation; review assigned textbook reading and/or lecture notes before class
2. Formulating and asking questions so as to understand concepts and processes as the material is covered and not immediately before an exam
3. Effort to use all resources provided—textbook, lecture notes, faculty and TA time, any extra reading, to improve comprehension
4. Recognition that a complex field like biochemistry requires background from previous courses, effort to prepare before class, effort to understand material as it is present in

class, and sufficient time and effort to integrate all pre-course, pre-class, and in-class material for mastery of the subject.

### **General OSU and Departmental Policies**

Please note: "Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know, or who need special arrangements in the event of evacuation, should make an appointment with the instructor as early as possible, no later than the first week of the term. In order to arrange alternative testing, the student should make the request at least one week in advance of the test. Students seeking accommodations must be registered with the Office of Services for Students with Disabilities."

The Department of Biochemistry/Biophysics follows the university policies on student conduct. These can be found at <http://oregonstate.edu/admin/stucon/regs.htm>.

Cheating or plagiarism by students is subject to the disciplinary process outlined in the Student Conduct Code. Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- \* cheating- use or attempted use of unauthorized materials, information or study aids
- \* fabrication- falsification or invention of any information
- \* assisting- helping another commit an act of academic dishonesty
- \* tampering- altering or interfering with evaluation instruments and documents
- \* plagiarism- representing the words or ideas of another person as one's own

The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student's freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Office of Student Conduct and Community Standards. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Office of Equity and Inclusion.