

Biology S105: Biochemistry, Biophysics, and Cell Biology

Note: Biol. S105 is co-taught, and divided into two parts. Each will count as 50% of your grade. Part I, (105A) which corresponds to the half-semester course Biology 101 in fall and spring semesters, will be taught by Dr. Robert Collins. Part II (105B) will be taught by Dr. Mark Mooseker, and correlates to Biology 102. Please read the entire syllabus. This syllabus is a general guide, and subject to change if necessary. Dr. Thomas Loreng, lecturer and course coordinator for Biology 101-4 during the academic year will serve as course facilitator for both halves of Biol S105.

Biol. S105 will have live class discussion sections Monday-Friday 10.30-12.15 EST June 7 - July 9, 2021. Students must attend during that time, and must have a web cam. Students will be participating in group activities, answering and asking questions, and presenting live. Technical requirements are detailed at <https://summer.yale.edu/academics/important-information-summer-online>

Academic Integrity:

Students are expected to read and understand "Appendix A" as outlined in the Yale Summer Session Handbook.

A student violating the terms outline Appendix A of the Yale summer session handbook in any assignment, test, or examination in this class will receive a minimum penalty of a zero (0) for that exam, quiz or assignment, and may receive a grade of "F" for the course at the discretion of the instructors.

Part I Biochemistry/Biophysics (Bio 105A)

Dr. Robert Collins
robert.collins@yale.edu

Office Hours: Following class,
and by appointment

Lecture: M-F 10.30-12.15
Via Zoom Meetings

GOALS: Bio 105A will introduce the common macromolecules of life and their function. In short, we will investigate life at the molecular level. Experimental methods and rationales will be introduced. Students will be asked to interpret data and understand related research and its impact on society.

TEXTS: Life: The Science of Biology, 11th edition, By Sadava et al. Sinauer/ WH Freeman, publishers. The eBook of the 11th edition or the 9th or 10th editions are acceptable, and I will list readings for all three versions. All Powerpoints will be posted to Canvas before the lecture, and all additional assigned readings can be downloaded via the course website.

Other readings and videos will be posted online.

ASSESSMENT for Bio 105A (50% of overall grade):

Weekly Quizzes: Three lecture periods will end with a quiz (administered on Canvas) focused on material presented during the previous lectures. No information in the assigned readings that is not discussed in lectures will be on the quizzes or exam. You are responsible for information in lectures that is not covered in the textbook. The quizzes make up 25% of your grade.

Homework: Posted on the course web site during the week, submit your work via the site by class time on the due date. The homework assignments make up **30%** of your grade. You may discuss the assigned exercises with classmates but must compose and write the answers independently.

Midterm Exam: Administered online during normal class hours on June 9th, and will count for **35%** of your grade

Participation: You will receive a score worth **10%** of your grade for participation in exercises and activities done in class, so come prepared and participate. Supplemental readings will be posted online and announced in class. Read the participation-grading rubric provided online.

Preliminary schedule, see Canvas modules for details. Changes to this plan will be announced in class, and on Canvas.

#	Date	Day	Topic	Activity	Sadava 11th	Additional
1	June 7	M	Introduction/What is Biochemistry?		22-34	
2	June 8	T	Proteins	Design Activity	45-50	
3	June 9	W	Protein Function and Folding	Discuss HW1 (Due 9am)	51-53, 314-315	FoldIt.pdf
4	June 10	Th	Carbohydrates, Lipids, Membranes and Thermodynamics of Life	Quiz 1 over lectures 1-3	54-61, 111-115, 120-123, 132-133, 151-156	
5	June 11	F	Enzymes	Discussion: Read Keasling .pdf	157-169	Keasling .pdf online
6	June 14	M	Metabolism and photosynthesis	Review HW2 (due 9 AM)	Chp. 9	
7	June 15	T	DNA Structure and Replication	Quiz Over lectures 4-6 Read Watson and Crick, Nature 1953	66-69 , 267-287	Watson and Crick.pdf
8	June 16	W	Transcription and Translation	Review HW3 (due 9 AM)	282-298	.pdf "1" online
9	June 17	Th	Gene Regulation, Gene Technology	Synthetic biology activity	337-345, 349-355, 284-285, 323-326, 381-396	.pdf "2" online
10	June 18	F	Genomics and other -omics	Quiz 3 over lectures 7-9	360-375, 319-323	.pdf "3" online
11	June 21	M	Special Topic: HIV/SARS-Cov_2	Discuss Merluzzi, et al 1990	348	Merluzzi. pdf
12	June 22	T	Midterm in Class			

COURSE DESCRIPTION:

Biology 105B (6/23/21-7/9/21): Cell Biology and Membrane Physiology

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Thomas Loreng: thomas.loreng@yale.edu

Content and course philosophy

This module will cover a number of central topics (as detailed below) in cell biology but will not focus on comprehensive coverage of all areas of cell biology and membrane physiology. Most lectures will highlight experimental examples from which the “facts” about a given topic were derived. There will also be discussion of key experimental methods and rationales.

For each topic, there will be a detailed outline of content, but the rate and depth at which topics are discussed will be gauged by my “real time” assessment of understanding based on the in-class problem solving sessions and performance on problem sets. That is, no attempt will be made to cover a set amount of material/lecture. While increasing your knowledge base of cell biology is a critical goal of the course, equally important will be developing an enhanced skill set in understanding experimental rationales, interpretation of experimental data sets and in reading the primary literature.

In addition to lectures, we will also discuss, a series of 5 classic research papers in cell biology. The methods and each data figure will be discussed most likely in Zoom break out room sub groups, each assigned a different set of figures.

Lecture Topics

Note that a detailed lecture outline and reading assignments in Karp will be posted on Canvas prior to the start of BIOL 105B.

In addition, the first half of the module will include a discussion of relevant experimental methods in the form of 3 short “Tool Kit” lectures:

1. Light and electron microscopy
2. Generation and use of antibodies; immunolocalization and fluorescence microscopy
3. Biochemical methods for analysis of cells and subcellular components

The main lecture topics, in the form of multi-lecture segments/topic will include the following:

1. Structural and functional properties of biological membranes
2. Membrane transport
3. Biosynthesis of secretory and membrane proteins; sorting signals and vesicular traffic
4. Endocytosis

5. The actin-based cytoskeleton
6. The microtubule-based cytoskeleton
7. Cell division

Modes of assessment:

There will be 5 problem sets. Problem sets 1-4 will be based on lecture content covered since the previous problem set. The problem sets are due by 5 PM the following day. The problem sets include questions on the most recent discussion paper as well as questions consisting primarily of interpretation of data sets from hypothetical experiments. For problem sets 1-4 you may collaborate (and are encouraged to do so) with other students in the class, although we ask you to identify your collaborators. The last problem set is non-collaborative and should be considered the equivalent of a short take home exam. The final problem set will contain questions based both the most recent lectures as well as earlier lecture content. This problem set will be screened for evidence of collaborative work and if found will be investigated as potential cheating infractions. Problem set 5 will be due by 10:30 AM Monday July 12

Final grade breakdown:

Participation, including class attendance and engagement in the discussion of the 5 assigned primary literature papers: 10%

Problem sets 1-4: 64%

Problem set 5: 26%

Reading:

The primary reading will be assigned from the text, *Cell and Molecular Biology by Karp, Iwasa and Marshall, 9th^h edition*. You may also acquire used versions (either hard copy or pdf) of the 7th or 8th editions (page numbers for these editions will be included). Here is the Wiley press link to rent an e version of the 9th edition:

Karp's Cell and Molecular Biology 9th edition

Ebook Rental (120 days) \$31

E-book (Permanent electronic copy) – \$112.50

Loose Leaf Print copy - 124.95

<https://www.wiley.com/en-us/Karp%27s+Cell+and+Molecular+Biology%2C+9th+Edition-p-9781119598169>