

Fall 2017: MCB C100A / Chem C130 *Biophysical Chemistry: The Molecules of Life*

Instructors: John Kuriyan and David Savage

Lecture Schedule and Course Outline

Textbook for the course:

"The Molecules of Life" by Kuriyan, Konforti & Wemmer (Garland Publishing)

Lecture: Tu/Thur 3:30 - 5:00 pm in 100 Lewis

	Date	Lecturer	Topic	Textbook Reading	Problem Sets
1	August 24, Thursday	JK-1	The genetic code. Introduction to protein and DNA structure. Qualitative description of intermolecular forces.	Chapter 1	
2	August 29, Tuesday	JK-2	Principles of nucleic acid structure. Part 1.	Chapter 2	
3	August 31, Thursday	JK-3	Principles of nucleic acid structure. Part 2.	Chapter 2	JK PS1: Intermolecular forces (Lecture 1)
4	September 5, Tuesday	JK-4	Principles of protein structure. Part 1.	Chapter 4	
5	September 7, Thursday	JK-5	Principles of protein structure. Part 2.		JK PS2: Nucleic acids (Lectures 2-3)
6	September 12, Tuesday	JK-6	Continue protein structure. Sequence-structure comparisons. Diversity in protein structure.	Chapter 4	
7	September 14, Thursday	JK-7	BLOSUM matrix and evolution of proteins	Chapter 5	JK PS3: Protein structure (Lectures 4-5)
8	September 19, Tuesday	JK-8	Start discussion of energy.	Chapter 6	
-	September 20, Wednesday	-	MIDTERM 1 (evening) 7 - 9 PM (Lectures 1-7)		JK PS4: Protein evolution (Lectures 6-7)

	Date	Lecturer	Topic	Textbook Reading	Problem Sets
9	September 21, Thursday	JK-9	Energy. The first law of thermodynamics.	Chapter 6	
10	September 26 Tuesday	JK-10	Heat capacity. Introduction to the Boltzmann Distribution. Molecular Energy function	Chapter 6	
11	September 28 Thursday	JK-11	Entropy. Calculation of multiplicity of coin tosses. Entropy is the logarithm of the multiplicity. The second law of thermodynamics.	Chapter 7	JK PS5: Energy (Lectures 8-10)
12	October 3, Tuesday	JK-12	Energy Levels and Entropy.	Chapter 8	
13	October 5, Thursday	JK-13	More on the Boltzmann Distribution. Temperature and heat flow.		JK PS6: Entropy (Lectures 11-12)
14	October 10, Tuesday	JK-14	Free Energy, predicting spontaneous reactions, relationship to work	Chapter 9 Section A,B	
**	October 11, Wednesday	-	MIDTERM 2 (evening) 7 - 9 PM (Lectures 8 to 13)		JK PS7: Boltzmann Distribution and free energy (Lecture 13)
15	October 12, Thursday	DS-1	Chemical Potential, concentration dependence, equilibrium.	Chapter 9C Chapter 10	
16	October 17, Tuesday	DS-2	Equilibria, temperature dependence, acid/base equilibria.	Chapter 10	
17	October 19, Thursday	DS-3	Equilibria continued.	Chapter 10	DS PS8: Chemical potential. (Lectures 14-15)
18	October 24, Tuesday	DS-4	Finish equilibria discussion, protein folding.	Chapter 10	
19	October 26, Thursday	DS-5	Oxidation-reduction: reactions in biology.	Chapter 11	DS PS9: Equilibria (Lectures 16-18)

	Date	Lecturer	Topic	Textbook Reading	Problem Sets
20	October 31, Tuesday	DS-6	Oxidation-reduction: reduction potential and free energy.	Chapter 11	
21	November 2, Thursday	DS-7	Ligand binding equilibria: Part 1.	Chapter 12	DS PS10: Redox (Lectures 19-20)
22	November 7, Tuesday	DS-8	Ligand binding equilibria: Part 2.	Chapter 12	
**	November 8, Wednesday	-	MIDTERM 3 (evening) 7 - 9 PM (lectures 15-20)		DS PS11: Ligand binding (Lectures 21-22)
23	November 9, Thursday	DS-9	Chemical Kinetics: Order of reactions.	Chapter 15	
24	November 14, Tuesday	DS-10	Chemical Kinetics: Arrhenius and Transition-state theory.	Chapter 15	
25	November 16, Thursday	DS-11	Principles of Enzyme Catalysis: Michaelis-Michaelis-Menton kinetics.	Chapter 16	DS PS12: Chemical kinetics (Lectures 23-24)
26	November 21, Tuesday	DS-12	Principles of Enzyme Catalysis: Inhibition.	Chapter 16	
-	November 24	--	Thanksgiving break		
27	November 28, Tuesday	DS-13	Principles of Enzyme Catalysis: Mechanisms.	Chapter 16	
28	November 30, Thursday	DS-14	Allostery. (Course evaluations)	Chapter 14	DS PS13: Enzymes (Lectures 25-27)
**	Friday, December 15	7-10 PM	FINAL EXAMINATION (comprehensive); location TBA	full course reading	