Chemical Principles of Biological Systems
3 Credits (Fall 2012)

Monday, Wednesday, Friday (9:00-10:00 AM)
9/24-12/10 Goldstein Hall (GU 2), Final Thursday 12/13 or Friday 12/14
Optional Friday discussions 4-5 PM GU 1093

#: Date	**Topic** [problem set coverage]	**Instructor**
	Part 1: Macromolecular Structure	
1: 9/24 M	Chemical principles of protein primary, secondary, tertiary and quaternary structure [set 1] **Problem set #1 out (Amber)**	Maher
2: 9/26 W	Protein post-translational modification: overview and examples [set 1]	Maher
3: 9/28 F	Protein post-translational modification. Case study: phosphorylation [set 1]. **WATCH ONLINE LECTURE PRIOR TO CLASS**: http://webcast.mayo.edu/viewer/content/special.php?Art_ID=8603&Format_ID=2&BitRate_ID=8 *and 4-5 PM TAs pretest prep session*	Maher
4: 10/1 M	Protein post-translational modification. Case studies: ubiquitination, farnesylation [set 1] **WATCH ONLINE LECTURE PRIOR TO CLASS**: http://webcast.mayo.edu/viewer/content/special.php?Art_ID=8683&Format_ID=2&BitRate_ID=8	Maher
10/3 W	**1-hour pretest** on chemical structures of amino acids, peptides, nucleic acids and lipids	
5: 10/5 F	Nucleic acid structure: primary structure [set 2] *and 4-5 PM Maher*	Strehler
6: 10/8 M	Nucleic acid structure: secondary structure [set 2] **Problem set #1 Due / Problem set #2 out (Amber)**	Strehler
7: 10/10 W	Nucleic acid structure: helices: A, B, Z DNA; RNA [set 2]	Strehler
8: 10/12 F	Nucleic acid structure: triple helices, quadruplexes; DNA-protein interactions [set 2] *and 4-5 PM Strehler*	Strehler
9: 10/15 M	Proteins Analysis: Common Methods for Protein Separation and Modification [set 3] **Problem set #2 Due / Problem set #3 out (Poorval)**	McCormick
10: 10/17 W	Mass Spectrometry (MS) and Protein Analysis by MALDI-TOF MS [set 3]	McCormick
11: 10/19 F	Protein Analysis by ESI and Tandem Mass Spectrometry [set 3] *and 4-5 PM McCormick*	McCormick
12: 10/22 M	Principles of X-ray crystallography [set 4] **Problem set #3 Due / Problem set #4 out (Amber)**	Mer
13: 10/24 W	Principles of NMR [set 4]	Mer
14: 10/26 F	Protein folding and misfolding [set 4] *and 4-5 PM Mer*	Ramirez-Alvarado

15: 10/29 M	Protein folding and misfolding [set 4]	Ramirez-Alvarado

	Part 2: Catalysis in Biology	
16: 10/31 W	Intro to Chemical and enzymatic catalysis [set 5] COURSE DROP DEADLINE	Radisky
17: 11/2 F	Chemical kinetics, velocity, rate constants, reaction order [set 5] *and 4-5 PM Ramirez-Alvarado*	Bajzer
18: 11/5 M	Enzyme kinetics [set 5] **Problem set #4 Due / Problem set #5 out (Poorval)**	Bajzer
19: 11/7 W	Enzyme kinetics [set 5]	Bajzer
20:11/9 F	Kinetic models [set 5] *and 4-5 PM Bajzer*	Bajzer
21: 11/12 M	Chemical and enzymatic catalysis, part 2 [set 6] **Problem set #5 Due / Problem set #6 out (Poorval)**	Radisky
22:11/14 W	Chemical and enzymatic catalysis, part 3 [set 6]	Radisky

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	Part 3: Membranes and Energy	
23: 11/16 F	Non-covalent interactions: lipids and biomembrane structure models: historical perspective and the fluid mosaic model of biomembranes [set 7] *and 4-5 PM Radisky*	Brown
24: 11/19 M	Why do membranes form? Water, hydrogen bonding and solubility, the hydrophobic effect: thermodynamics governing lipid solubility [set 7] **Problem set #6 Due / Problem set #7 out (Amber)**	Brown
25: 11/21 W	Lipid aggregates (micelle vs. bilayer): implications for biological processes [set 7]	Brown
11/23 F	**Thanksgiving Break: No Class**	
26: 11/26 M	Lipid phase transitions and phase structure. Maintenance and functional consequences of transbilayer lipid asymmetry [set 7]	Brown
27: 11/28 W	Ion equilibrium and membrane potential [set 8]	Alekseev
28: 11/30 F	Ion channel conductance and selectivity [set 8] *and 4-5 PM TAs*	Alekseev
29: 12/3 M	Architecture of ion channels [set 8] **Problem set #7 Due / Problem set #8 out (Poorval)**	Alekseev
30: 12/5 W	Conversion of oxidative energy into ATP: oxidative phosphorylation and chemiosmotic theory, part I [final]	Strehler
31: 12/7 F	Conversion of oxidative energy into ATP: oxidative phosphorylation and chemiosmotic theory, part II [final] *and 4-5 PM Alekseev*	Strehler
32:12/10 M	Conversion of oxidative energy into ATP: oxidative phosphorylation and chemiosmotic theory, part III [final] **Problem set #8 Due**	Strehler
12/13 R	**Option 1: In-Class Final Exam 8 AM - 1 PM**	

	Location: GU 1598	
12/14 F	**Option 2: In-Class Final Exam 8 AM - 1 PM** **Location: GU 1598**	