

**MCB 100B Spring 2016: Biochemistry: Pathways, Mechanisms, and Regulation**  
Instructors: Roberto Zoncu, Michael Marletta, David Savage

**Part A. Specificity and Signaling – Roberto Zoncu**

Textbook resources:

1. The Molecules of Life by Kuriyan, Konforti & Wemmer. Chapters 11, 12, 13 and 17. (The course will build on material covered in MCB 100A).
2. Lehninger's Biochemistry, Chapter 12. Note: either 5<sup>th</sup> or 6<sup>th</sup> edition are acceptable.

Lecture 1, Tue 1/19. Receptor tyrosine kinases and protein-protein interaction networks.

Lecture 2, Tue 1/21. Binding affinity and specificity in molecular interactions. Analysis of binding with multiple targets.

Lecture 3, Thur 1/26. Protein-protein interactions, protein-nucleic acid interactions.

Lecture 4, Tue 1/28. Random walks, diffusion and Brownian motion. Chemotaxis.

Lecture 5, Thur 2/2. Molecular flux and transport. Fick's laws. Measurement of diffusion constants.

Lecture 6, Tue 2/4. Membrane potentials, the Nernst Equation, free energy of transporting ions.

Lecture 7, Thur 2/9. Ion pumps and transporters.

Lecture 8, Tue 2/11. The transmission of action potentials in neurons.

Lecture 9, Thur 2/16. Second messenger and G protein-coupled receptor signaling.

**Part B. Central Metabolism and Enzyme Principles – Michael Marletta**

Textbook resources:

Lehninger's Biochemistry. Chapters 6, 13, 14, 15, 16, 19.

Lecture 10, Thur 2/18. Enzyme reaction mechanisms and cofactor function.

Lecture 11, Tue 2/23. Enzyme reaction mechanisms and cofactor function.

**New Midterm 1 Time: Tue 2/23, 7-9 PM. 101 Morgan. (Zoncu material only)**

Lecture 12, Thur 2/25. Introduction to Metabolism: Logic and pathways.

**Rescheduled above. Midterm 1 Time: Thur 2/25, 6-8 PM. 100GPB. (Zoncu material only)**

Lecture 13, Tue 3/1. Glucose metabolism.

Lecture 14, Thur 3/3. The Citric Acid Cycle.

Lecture 15, Tue 3/8. Regulation of Metabolism.

Lecture 16, Thur 3/10. Bioenergetics.

Lecture 17, Tue 3/15. Oxidation and reduction reactions.

Lecture 18, Thur 3/17. Oxidative phosphorylation and electron transport.

**Spring Break: 3/21 – 3/25.**

**Part C. Molecular Physiology Expanded – David Savage**

Textbook resources:

Lehninger's Biochemistry. Chapters 14, 15, 17, 18, 19, 20, 21, 22.

Lecture 19, Tue 3/29. The regulation and storage of sugar in the cell.

**Midterm 2: Tue 3/29, 6-8 PM. 2040 VLSB. (Marletta material only)**

Lecture 20, Thur 3/31. Techniques for quantitating metabolism.

Lecture 21, Tue 4/5. Fatty acid degradation.

Lecture 22, Thur 4/7. Amino acid degradation and the urea cycle.

Lecture 23, Tue 4/12. Photosynthesis and the Light Reactions.

Lecture 24, Thur 4/14. Carbon assimilation and the Dark Reactions.

Lecture 25, Tue 4/19. Lipid biosynthesis.

Lecture 26, Thur 4/21. Synthetic biology and engineering metabolism.

Lecture 27, Tue 4/26. Amino acid and nucleotide biosynthesis.

Lecture 28, Thur 4/28. Cancer and metabolism.

**RRR Week: 5/2 – 5/6.**

**Combined Midterm 3 and Final: Wed 5/11, 11:30-2:30. Location TBA.**