Text: *Concepts in Biochemistry*, 2nd Edition (Rodney Boyer)
Supplementary material: *Interactive Concepts in Biochemistry* CD
Website: http://www.boyerbiochem.com

Chapter	Lecture	Topic	CD Resources/ Assignment	Background Material Needed for Lecture
Part I. Molecules and Life, Chapters 1-4				
	1	Course Introduction, Organic Chemistry Overview	Cutting Edge: Hot Careers in Biochemistry, Visionaries of Science	Overview of organic chemistry principles
1	**2**	What is biochemistry? Organelles, Cells, and Organisms	Interactive Animation: Cell Structure	Organic Chemistry: functional groups
2	**3**	Noncovalent interactions. Brief overview of biological information, DNA, RNA, and protein synthesis	Structure Tutorial: DNA, tRNA Interactive Animation: Central Dogma of Biochemistry, Protein Synthesis, Signal Transduction; Concept Review: Noncovalent bonding Cutting Edge: Molecular Recognition	Electronegativity. Chemical bonding: covalent, polar-covalent, and ionic bonds
3	**4**	Structure of water. Biomolecules in water, pH, pK_a	Concept Review: Logarithms; Water, pH and noncovalent bonding	Acids and bases. Hydrogen bonding
	5	Henderson-Hasselbalch Equation, Buffers		
4	**6**	Properties of amino acids: acid base reactions, classification, reactivity	Interactive Animation: Amino Acid Game Structure Tutorial: Antibodies	Stereochemistry: isomerism, chiral molecules, drawing chemical structures. Noncovalent interactions
	7	Polypeptides and proteins. Protein function, size, composition, properties		
	8	Protein structure, sequencing, chromatography		
Examination # 1, Chapters1-4				
Part II. Dynamic Function of Biomolecules, Chapters 5-9				
5	**9**	Protein design: 1^0, 2^0 structure.	Structure Tutorials: Secondary Structure Interactive Animation: Protein Folding Structure Tutorials: Myoglobin, Hemoglobin, Kinesin, Antibodies. Cutting Edge: Prions	Noncovalent interactions. Properties of amino acid side chains (Chapter 4)
	10	Protein design: 3^0, 4^0 structure. Biological function of some proteins		
6	**11**	Enzymes: catalysis, nomenclature, kinetics (Michaelis-Menten equation)	Concept Review: Elementary Kinetics Interactive Animation: Catalysis, Enzyme Specificity, Enzyme Inhibition Cutting Edge: AIDS Therapies	Interpreting graphs. Slope of a line. Acids and bases. Noncovalent interactions.
	12	Enzymes: reactions, mechanism, inhibition		

7	**13**	Enzymes: coenzymes	Structure Tutorial: Antibodies Cutting Edge: Ribozymes, Catalytic Antibodies	Interpretation of graphs. Formation and cleavage of phosphoesters, amides, disulfides.
	14	Enzymes: regulation		
8	**15**	Carbohydrates: structure, reactions	Cutting Edge: Molecular Recognition	Oxidation of aldehydes. Hemiacetal and acetal formation. Stereochemistry: isomerism, chiral molecules, drawing chemical structures.
	16	Carbohydrates: disaccharides, polysaccharides, glycoproteins		
9	**17**	Lipids: structure, function	Interactive Animation: Cholesterol, Cellular Transport Cutting Edge: Fat blockers	Cell structure (Chapter 1). Nonpolar interactions. Formation and cleavage of esters, amides.
	18	Lipids: biological membranes, membrane transport		
Examination # 2, Chapters 5-9				
Part III. Storage and Transfer of Biological Information, Chapters 10-13				
10	**19**	DNA, RNA: composition, structural elements	Structure Tutorial: DNA, tRNA Interactive Animation: Central Dogma of Biochemistry, Nucleotides Game, Restriction Digestion and Electrophoresis Cutting Edge: AIDS Therapies	Hydrophobic interactions, hydrogen bonds. Formation of phosphoesters, N-glycosidic bonds. Structure of aromatic heterocyclic compounds.
	20	DNA, RNA: nucleases, nucleic acid-protein complexes		
11	**21**	DNA: replication, damage and repair	Interactive Animation: DNA Replication Cutting Edge: Telomeres, Ribozymes	Nucleotide structure. DNA, RNA structure. Enzymes.
	22	RNA: synthesis (transcription), processing		
12	**23**	RNA Translation: genetic code, protein synthesis, processing, regulation	Structure Tutorial: tRNA, Protein-DNA Interactions. Interactive Animation: Central Dogma of Biochemistry, Protein Synthesis	Cell structure, Ribosomes, ER (Chapter 1). Protein structure (Chapter 5).
13	**24**	Recombinant DNA: cloning vectors, applications	Interactive Animation: Cloning, Polymerase Chain Reaction Cutting Edge: DNA Fingerprinting	Bacterial cell. Bacterial, and eukaryotic DNA.
Examination # 3, Chapters 10-13				
Part IV. Metabolism and Energy, Chapters 14-20				
14	**25**	Introduction to metabolism, Bioenergetics	Concept Review: Thermodynamics, Redox Reactions, Logarithms Interactive Animation: Introduction to Metabolism	Bond energy, Hess's Law. Standard Free Energy change for reactions, ΔG^{o}. Phosphoester, thioester and amide formation and hydrolysis.

15	**26**	Metabolism of Carbohydrate: Glycolysis. Dietary carbohydrates, glycogen and starch.	Structure Tutorial: Hexokinase, Phosphofructokinase Interactive Animation: Glycolysis, Gluconeogenesis	Carbohydrate structure (Chapter 8). Regulation of Allosteric Enzymes (Chapter 7). Signal transduction (Chapter 2).
	27	Metabolism of Carbohydrates: Lactate, ethanol fermentation. Gluconeogenesis, regulation of carbohydrate metabolism.	Interactive Animation: Gluconeogenesis Cutting Edge: Alcohol Abuse; Methanol as fuel	
16	**28**	Pyruvate Dehydrogenase Complex	Interactive Animation: Pyruvate Dehyd-rogenase Complex, Citric Acid Cycle	Cell structure; organelles, (Chapter 1). Coenzymes (Chapter 7) Metabolic reaction types (Chapter 14). Gluconeogensis (Chapter 15)
	29	The Citric acid cycle, regulation and roles	Interactive Animation: Citric Acid Cycle	
17	**30**	Electron transport	Concept Review: Redox Reactions	Cell structure; organelles (Chapter1). Cell membranes (Chapter 9). Oxidation-reduction principles. Bioenergetics (Chapter 14). Structure of ATP (Chapter 14).
	31	Oxidative phosphorylation	Interactive Animation: Oxidative Phosphorylation	
	32	Photosynthesis	Interactive Animation: Photosynthesis	Structure of plant cells (Chapter 1). Cell membranes (Chapter 9)
	Examination # 4, Chapters 14-17			
18	**33**	Metabolism of Lipids: triacylglycerols, beta oxidation of fatty acids	Interactive Animation: Fatty Acid Metabolism Cutting Edge Article: Fat Blockers	Structure of fatty acids, triglycerides (Chapter 9) Metabolic reaction types (Chapter 14)
	34	Metabolism of Lipids: biosynthesis of fatty acids, cholesterol, transport of lipids	Interactive Animation: Cholesterol	
19	**35**	Metabolism of Amino Acids and other Nitrogen Compounds: Nitrogen cycle, bio-synthesis and catabolism of amino acids.	Cutting Edge Article: Homocysteine	Amino acid structures (Chapter 4). Citric acid cycle (Chapter 16)
	36	Metabolism of Amino Acids and other Nitrogen Compounds: Amino acid metabolism, Urea cycle, purine and pyrimidine metabolism.	Cutting Edge Article: Nitric Oxide and Viagra	
20	**37**	Integration of metabolism: Strategies of metabolism, specialization and integration	Interactive Animation: Cori Cycle Interactive Animation: Metabolic Process Location	Overview of carbohydrate, lipid, and nitrogen metabolism. Signal transduction (Chapter 2).
	38	Integration of metabolism: Metabolic control, response to stress, obesity	Cutting Edge Article: Fat Blockers	
Cumulative Final Examination				