Topics for the final exam: Chem142A (Kahn, Summer 2009)

Large portion of questions on the final will test your understanding of material from all the chapters covered in this course. Below are topics that you should study well in addition to these that were covered in the two midterms.

Chapter 8. You should be familiar with everything that was covered in the lecture. Overall, this is a really important chapter, partially because biochem majors need to know this material for Chem142C. Make sure that you know all about:

- Functions of various nucleotides and nucleic acids
- Structures of ribose and deoxyribose (ring forms)
- Structures and H-bonding properties of five nucleobases: A, C, G, T, and U
- Nomenclature of nucleosides and nucleotides
- Functional significance of minor nucleosides in bacterial and eukaryotic DNA
- Covalent structure of DNA and RNA (e.g. “write complete chemical structure of a messenger RNA that that has the sequence AUGUC”)
- Stability and hydrolysis of DNA and RNA
- Structure of DNA base pairs
- Experiments that lead to the identification of DNA as the genetic material
- Interpretation of data that lead to the determination of DNA structure
- Structure and molecular interactions that stabilize the B-form of DNA
- Chemical basis of inheritance: semi-conservative replication of DNA
- Palindromic sequences and hairpin structures
- Biological function of telomeres and of telomerase
- Structural and functional differences between mRNA, tRNA and rRNA
- DNA denaturation and experimental means to study this process
- Application of hybridization phenomenon in molecular biology & forensics
- Mechanisms of mutagenesis

Chapter 9. You need to know the concepts that we covered in the lecture. The textbook is much more detailed and comprehensive than the lecture; biochem majors are encouraged to read this material. The important concepts to understand are:

- What is recombinant DNA, recombinant organism?
- DNA Cloning: why and what are the basic steps
- Use of restriction endonucleases in cloning
- Use of antibiotics to select transformed cells
- Characteristics of cloning and expression vectors
- Polymerase chain reaction: principles and applications
- How to separate DNA molecules according to their size or shape
- How to detect specific DNA sequences via hybridization (Southern blot)
- Principle and use of restriction fragment length polymorphism analysis
- How to clone eukaryotic genes?
- What is cDNA?
- Working principle of DNA microarrays
- Application of DNA microarrays for confirming the presence of specific mRNA-s
- Application of DNA microarrays for comparing mRNA expression levels
- Benefits, drawbacks, and ethical implications of artificially generated organisms
Chapter 10. Be familiar with various functions lipids play in the organism, as well as basic structures of fats and phospholipids. However, we will go light on detailed chemical structures of most lipids. So, be prepared to answer questions about:

- Functions of lipids, with examples and explanations
- Physical and chemical properties of fatty acids, fats, and waxes
- General structure of saturated and unsaturated fatty acids
- General structure of cis and trans fatty acids
- Structures of palmitic, stearic, arachidic, oleic acid, and linoleic acid
- Structure and biological importance of waxes
- Structures of glycerol and triacylgerols
- General structure of glycerophospholipids
- Structure of choline and phosphatidylcholine
- General structure and functions of ether-linked lipids
- General structure of sphingolipids; biological importance of sphingomyelin
- Structural determinants of blood groups (ABO)
- General structure of steroids
- Structure of cholesterol, testosterone, and estradiol
- Biological function of sterols and steroids
- Origin and function of paracrine lipid hormones

Chapter 11. We focus on the structure, function and main properties of membranes and membrane proteins. Material about specific transporters is recommended reading for biochem majors but will not be on the test. Know all about:

- Biological roles of membranes and membrane proteins
- Chemical composition and physical properties of membranes
- Unique features of archabacterial membranes
- Modulation of membrane rigidity by its composition
- Integral and peripheral membrane proteins
- Anchoring of proteins to the membrane: general principles
- Anchoring of proteins to the cytoplasmic side via C-terminal farnesylation
- Dynamics of lipids in the membrane
- Fluorescence recovery after photobleaching
- General structure of vesicles and micelles
- Structure/function of nerve cells and function of nicotinic acetylcholine receptor