CHEM 641 Study Sheet

1st Exam, Sat 10/6/2007, 10am - noon, 100 Kirkbride, no calculators
2 help sessions: Thur (10/4) and Fri (10/5) 7:30-9pm in 205 Gore Hall.

Reading

Lehninger 4th edition, Chapters 1-5, not including: details of protein sequencing in Chp. 3, fibrous proteins in Chp. 4, and section 5.3. Also, refer to the class links page for topics covered up until Thursday 9/27/07.

General topics you should know

Knowledge of central dogma of where protein comes from (DNA → mRNA → protein)
Weak forces - van der Waals, H-bonding, ionic bonds, hydrophobic Interactions
Properties of water - related to weak forces
Hydrophobic effect, clathrate, micelle, lipid bilayer, up to biological membrane
Ionic equilibria - as it relates to physiological conditions - weak acids and bases
What is Gibbs free energy, enthalpy and entropy?
Thermodynamic-equilibrium (ΔG) vs. kinetic (Ea) effects
Amino acids- chirality, names, 3 and 1-letter abbrev., structures, acid-base of 20 naturally occurring, general acid/base catalysis and interactions side chains may make in a protein structure
1º protein structure- general picture of how proteins are made, protein sequence alignments, peptide bond, cis vs. trans peptide bond, peptide planes, PHI and PSI tortion angles, polar character, sequence determines structure, be able to draw, i.e. a tri-peptide
2º protein structure- α-helix, amino acid helix propensity, helical wheel, parallel and antiparallel β-sheets, β-turns, amphipathic helices and amphipathic β-sheets
super-secondary structure, 3º and 4º protein structure - classes of globular proteins, principles of protein folding, protein prep and purification, simple expression approach, affinity, size exclusion and ion exchange chromatography, Native and SDS PAGE, IEF, 2D gels, homogeneity vs. heterogeneity of proteins
Structural models by crystallography, NMR and homology modeling basic ideas covered in class, no equations here.
Cooperativity and the hemoglobin system
Antibodies, ligand binding, catalytic antibodies and transition-state binding

Equations you should know, and more importantly, know how to use

General ionic equlibria equations, like:

$pH = pKa + \log [A^-]/[HA]$ (Henderson Hasselbalch)

$pH = -\log[H^+]$, $pH + pOH = 14$, $Ka = [A^-][H^+]/[HA]$

Thermodynamics:

$\Delta G = \Delta H - T\Delta S$ $\Delta G^{\circ\prime} = -RT \ln Keq$

Equations and constants that will be supplied if needed

equations related to 1st and 2nd Law of Thermodynamics and Weak Forces

$R = 8.315\ J.mol^{-1}K^{-1}$

All values of concentrations, $\Delta G^{\circ\prime}$, Keq, pKa values etc....

Structures of bio-molecules except those listed above