

## Review for 1st Exam – Chem 391 - Fall 2007

This exam will be offered from **9 AM – 10:20 AM** on Tuesday, October 4<sup>th</sup>. It is closed book/closed notes. You may use a calculator.

### Intermolecular Forces and Thermodynamics

$$\Delta G = \Delta H - T\Delta S \quad \text{and} \quad K_{eq} = \exp(-\Delta G^\circ/RT)$$

$$R = 1.987 \text{ cal/mol K, } T \text{ is in Kelvin (0 }^\circ\text{C} = 273 \text{ K)}$$

Calculation and meaning of  $\Delta\Delta G$

Enthalpy = Intermolecular forces, Entropy = Disorder

Intermolecular forces: Relative strengths, appropriate geometries

Contributions to entropy – **Hydrophobic Effect** especially

### Physical Methods

Fluorescence Spectroscopy - As a monitor of protein folding, 3° structure

Circular Dichroism - understand how it is used, what info it gives

NMR – Basics of COSY and NOESY. Model interpretation.

Crystallography - Resolution, R-factor, stereochemical “goodness”

### Amino Acid Structure → Tertiary Structure

Know the 20. Chemistry (especially acid-base) and Structure

Conformational flexibility of the backbone (Ramachandran plot)

Basic features of secondary structure and geometry

Amphiphilic helices, the macrodipole and other issues in helix stabilization

Hydrophobic core in 3° structure stabilization

Determination of protein stability by thermal melts, denaturant titrations

### Nucleic Acid Structure

Know the bases (a numbering scheme will be provided as necessary)

Covalent structure of nucleotides and polynucleotides

A little phosphoester chemistry

Contributions towards helix stability

Major Groove vs. Minor Groove

A conformation vs. B conformation in DNA

Hydration and base composition and their effects

RNA Secondary Structure (odd base pairing, stems, loops)

### Ligand Binding

Definition of the dissociation constant,  $K_d$ .

In vitro selection of function in RNA

Structure and function in hemoglobin and myoglobin

Induced fit model (vs. Lock & Key)

Lectures, problem sets and *PyMol* exercises are the fodder for the exam.