Review for 1st Exam – Chem 391 - Fall 2018

Intermolecular Forces and Thermodynamics

$\Delta G = \Delta H = -T\Delta S$ and $K_{eq} = \exp(-\Delta G°/RT)$

R = 0.001987 kcal/mol K, T is in Kelvin (0 °C = 273 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

Lipids

Fatty acid nomenclature, familiarity with phospholipid structure

Micelles vs vesicles, thermodynamics of aggregation

CMC vs. structure

Protocell paper

Amino Acid Structure → Quaternary Structure

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

Conformational flexibility of the backbone (Ramachandran plot)

Basic features of secondary structure, stabilization and geometry

Hydrophobic core in 3° structure stabilization

Determination of protein stability by thermal melts, denaturant titrations

Stapled Helix Paper, FlAsH labeling paper

Physical Methods

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

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"

Switch Arc paper

Nucleic Acid Structure

Memorize the six bases A,G,I (purines) and C,T,U (pyrimidines)

Nucleosides and nucleotides, primary structure of nucleic acids

Ribose/deoxyribose, open chain and furanose forms

Contributions towards double helix stability (base stacking!)

Major Groove vs. Minor Groove

A conformation vs. B conformation in DNA/RNA

Hydration and base composition and their effects

RNA secondary and tertiary structure

DNA Origami paper

Receptor-Ligand Interactions

The algebra and plotting

Predicting ligand binding interactions (biotin/avidin, steroid receptors)

RNA Aptamers

Protein-DNA interactions. Direct and indirect readout. Major groove interactions.

Allosteric control of DNA-binding activity (TrpR)