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Chem. 581 Chemical Biology Syllabus (Preliminary)

Nucleic Acids

1. Introduction/Overview of nucleic acid structure.
2. Solid state approach to nucleic acid synthesis.
 - a. DNA
 - b. RNA
3. Solution state synthesis of DNA.
4. Synthesis of modified nucleosides and nucleotides.
 - a. Modifications at the sugar i.e. AZT/ddI etc.
 - b. Modifications at the base i.e. 8-oxo-dG, base alkylation etc.
5. Synthesis of modified oligonucleotides.
 - a. Phosphothioates and dithiophosphates, methylphosphonate synthesis.
 - b. Antisense oligonucleotide therapy.

Proteins/Peptides.

1. Introduction/Overview of amino acids and functional groups.
2. Solid state peptide synthesis.
 - a. Fmoc/TBOC approaches.
3. Unnatural amino acid incorporation into peptides.
 - a) Impact on peptide structure and function.
4. Protein-Nucleic acids (PNA's).
 - a. Synthesis, structure and potential applications.

Interaction of "small" molecules with biomolecules

1. Interactions with proteins.
 - a. Physical parameters for active site binding of organic and inorganic molecules.
 - b. Designing organic and inorganic molecules for optimal active site binding.
 - c. Impact on protein structure and function.
2. Interactions with nucleic acids.
 - a. Organic and inorganic molecule interactions with nucleic acids, binding, intercalation, minor and major groove stacking.
 - b. Impact on nucleic acid structure and function.

Software and Web-Based Resources for Protein and Nucleic Acid Structure.

1. Freeware available for Molecular Modeling of Protein and DNA Structure.
 - a. Rasmole
 - b. Chime
- 2) Web-Based resources for structural and comparative chemical biology.