

**BCMB/CHEM 8190**  
**PROBLEM SET 4**

- 1) A dilute protein solution at 330K gave rise to  $^{13}\text{C}$   $\alpha$  resonances with spin lattice relaxation times of 30ms when examined at a spectrometer frequency of 15MHz. A full NOE was also observed. Estimate the size of the protein. Note: You will need the Stokes formula relating the molecular correlation time to solvent viscosity, temperature and radius of an equivalent sphere. (page 17 of Cavanagh).  $\tau_c = (4\pi\eta a^3)/(3kT)$ .
- 2) An adenine in a bulge of a nucleic acid helix is said to be flipped out in solution instead of being stacked between adenine rings of adjacent base pairs. Using the remote group model for benzene to approximate the effect of the adenine rings, what would you expect for the chemical shift of the H2 proton of the flipped out adenine compared to other adenine H2s?
- 3) What would you expect for the alpha carbon chemical shift of an alanine when it was in an alpha helix of a protein as compared to a beta sheet?