1. For each of the following questions, write in a number which you think best represents the quantity you are being asked for. An error of ±20% will be tolerated.  

   Light with a wavelength of 190 nm corresponds to energy of ______________ kcal mol⁻¹.  

   In a hydrogen bond, an average value of the [X–H···Y] angle is ______________ °.  

   Analytically useful part of the infrared spectrum is between ______ and ________ cm⁻¹ in wavenumbers.  

   An equilibrium constant of 50 corresponds to ΔG of ______________ kcal mol⁻¹.  

   To break up a typical C–H bond, you need light with a wavelength lower than ______________ nm.  

   Exergonic reactions have K_{eq} values that are higher than ______________.  

   Distance between the two carbon atoms shown below is approximately ______________ angstroms.

   ![Diagram of aromatic compounds with a double bond between two rings.]}
2. In the class where we discussed photoresists, we looked at photoacids: acids generated in situ by the irradiation of sulfonium salts. Propose a starting material and a mechanism for the generation of a photobase through an analogous irradiation process. 20 points
3. In the spaces below, give your five favorite bases, reducing agents, electrophiles, and acids. Rank them in the order of their increasing strength in the given category (e.g. from weakest to strongest oxidizing agent).

\[ 4 \times 10 = 40 \text{ points} \]

**Bases**

**Reducing Agents**

**Electrophiles**

**Acids**

4. Is isotactic or syndiotactic polypropylene more stable? Provide a detailed stereochemical explanation of your response.

\[ 40 \text{ points} \]
5. Consider the molecule below. What noncovalent interactions is it likely to engage in with itself (i.e. in the absence of solvent)? Estimate the total strength of all of the interactions a single molecule engages in (in kcal/mol) and sketch how it may organize in the solid state.  

40 points
6. Binding phenomena can be characterized calorimetrically, since a favorable binding event releases energy. Consider a binding process wherein a host with a $M = 500 \text{ g mol}^{-1}$ binds a guest with a $M = 100 \text{ g mol}^{-1}$ with an equilibrium constant of 1000. What amount of energy would be released when 5 g of this host are mixed with 5 g of this guest in 1 L of a solvent?  

20 points