1. What is the Hammett  value for the following reaction and calculate K when X = p-NO2 and when X = p-Cl.
2. What do you expect the signs and relative magnitudes of the  values to be for the substituents S(O)CH3 and SCH3 in the meta and para positions? Explain.
3. What do you expect the signs and relative magnitudes of the meta and para  values to be for the substituent N(CH3)3+? NHCOCH3? Explain.
4. Explain the relative magnitudes and signs of  for NHCOCH3? And NH2.
5. Show the product of the reaction below, and explain the sign of the Hammett  value.
6. 
7. What is the sign of the Hammett  value for the following reaction? Explain.



1. Sketch a plot like Figure 13.7 if Aac1 were always operative. Explain.



1. Sketch a plot of Figure 13.8 if step 2 were always rate determining. Step 3 were always rate determining. Explain.
2. Determine the signs and estimate the relative magnitudes of the Hammett  values for the following reactions relative to each other and ionization of benzoic acids. Explain.



1.  The rate constant when X is an *ortho* N(CH3)2 does not fit with the data for other substituents of a plot for the following reaction. Show the reaction detailing why this occurs and discuss what factors determine whether the reaction should be faster or slower than predicted by the line.

1. Estimate and explain the signs and relative magnitude of Es for the cyclohexyl and triflouromethyl groups.