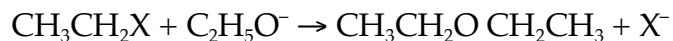
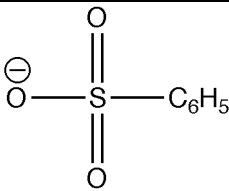


Sample Mid-quarter exam 2 (Chapters 8, 9, 10 and 11)

1. a. (6 points) Explain the following trend for S_N2 reactions:



X =		Br	Cl	NH ₂
Relative rate (Br = 1.0)	76.3	1.0	0.0131	10 ⁻¹¹

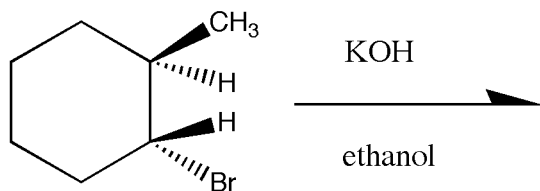
b. (4 points) What relative rate would you expect if X = I?

c. (6 points) The solvation energies for the halide ions are given below:



Use this information above to justify the halogen relative rate of S_N2 reaction trend for the reaction $\text{CH}_3\text{CH}_2(\text{HPO}_4) + \text{X}^- \rightarrow \text{CH}_3\text{CH}_2\text{X} + \text{HPO}_4^-$ (the HPO_4^- is a good leaving group). As a reminder, the reaction above is fastest for X = I and slowest for X = F. Hint: But there's no gas phase in an S_N2 reaction! Wait, what does a nucleophile have to do with the solvent molecules just before the reaction takes place?

2. Consider the following reaction:



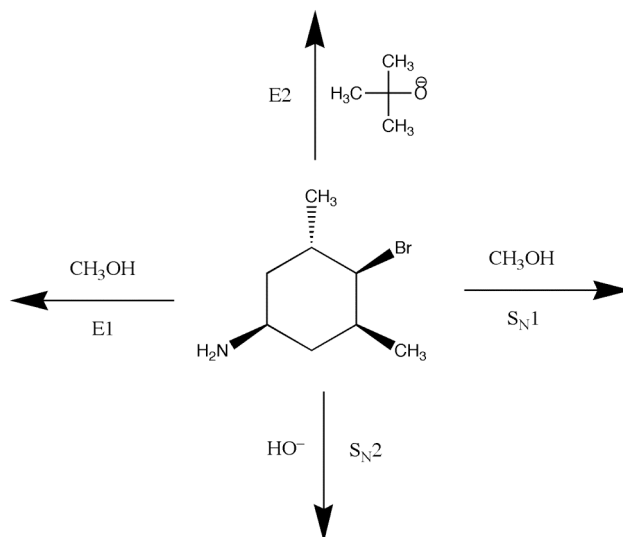
a. (6 points) Write the two possible structures resulting from elimination of HBr from the reactant.

b. (2 points) Which is the major product under E2 conditions?

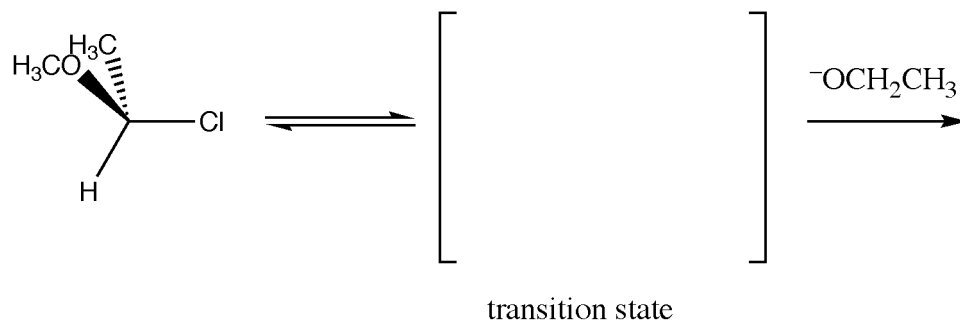
c. (2 points) Which is the major product under E1 conditions?

d. (5 points) Draw an energy diagram that demonstrates energy changes during the E2 reaction. Points to include: exergonic or endergonic? transition state structure (write it)? energy level path during the reaction? Hammond postulate consistency?

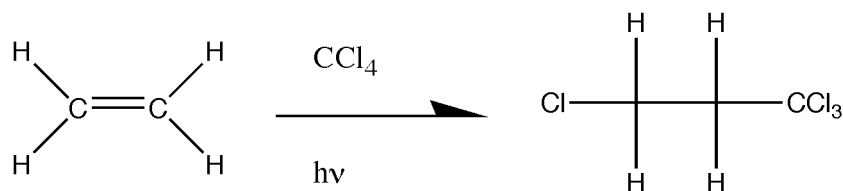
3. (8 points) Draw the products for the following reactions (the mechanism is given for each reaction). Be sure to show the stereochemistry of the products. Use "NR" to indicate no reaction, if needed.



4. (6 points) Draw the transition state and final product(s) for the following S_N1 reaction. Be sure to show pertinent stereochemistry. If there is more than one product, indicate the preferred product. Give a justification why the preferred product is preferred, if relevant.



5. (10 points) Write the mechanism for the following reaction:



Hint: there is more than one step.

