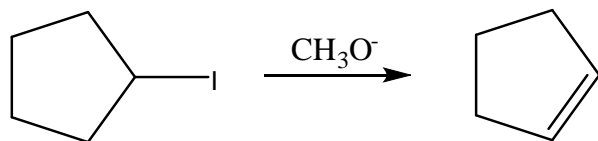


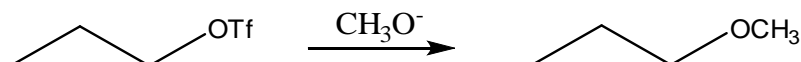
Chemistry 2500 (Fall 2017): Assignment #16 – E1/E2/S<sub>N</sub>1/S<sub>N</sub>2

1. In each of the following reactions indicate whether the ethoxide anion behaves as a nucleophile or base:

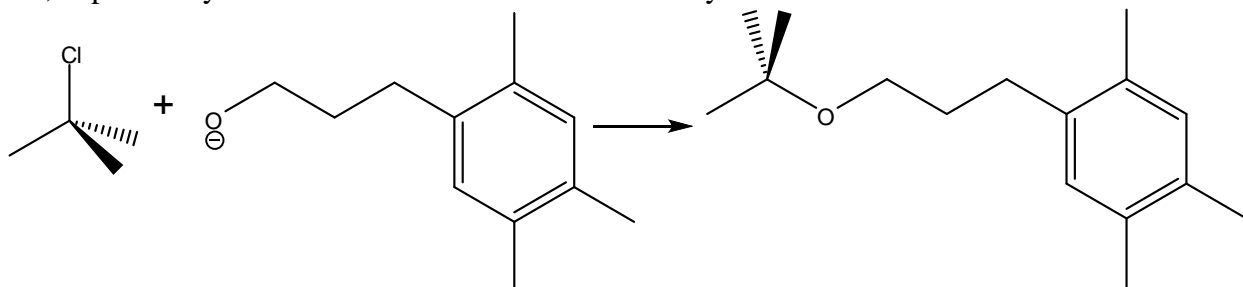
a)



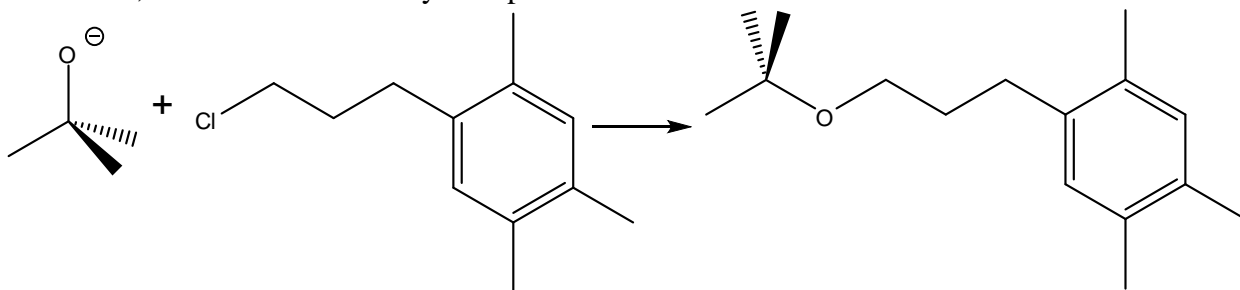
b)



2. a) A new employee at Merck has been in charge of preparing a specific ether (product of the following reaction). The employee chooses to attempt a Williamson ether synthesis according to the following scheme. Does the reaction work as planned? If not, explain why not and indicate what reaction actually occurred.



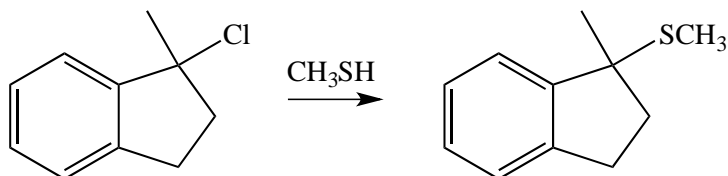
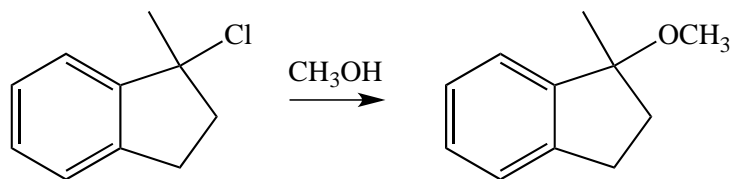
- b) If the substrates were reversed (as follows) would the reaction work? Why or why not? If not, what reaction would you expect to dominate?



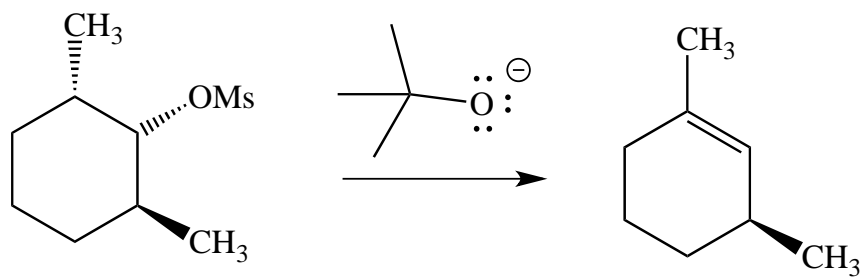
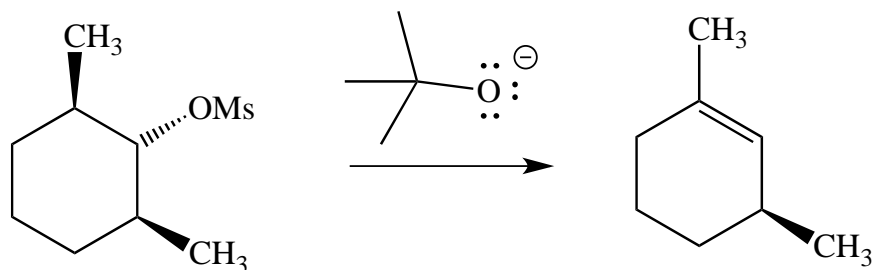
- c) How would you prepare this molecule?

3. Which of the following pairs of reactions, if either, is faster? In 10 words or less explain your reasoning and indicate which mechanism ( $S_N1$ ,  $S_N2$ , E1, E2) applies.

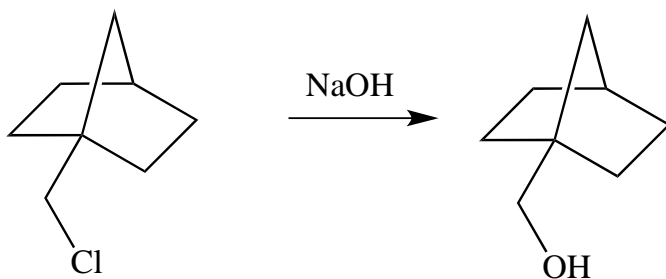
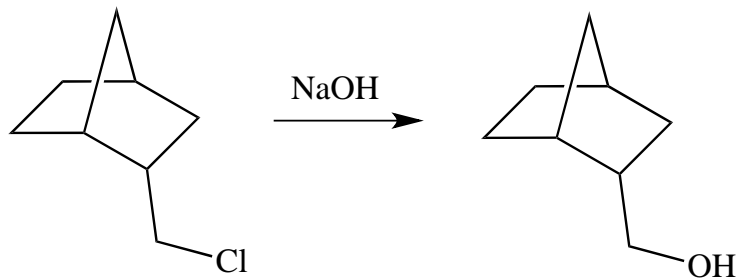
a)



b)

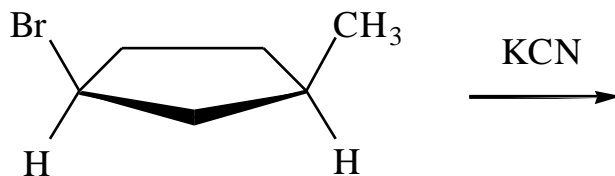


c)

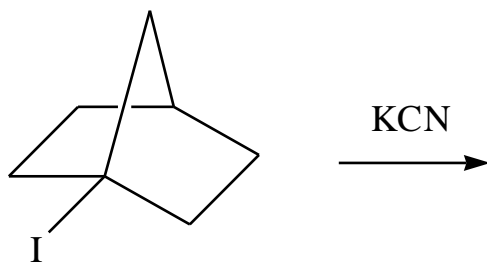


4. For each of the following reactions, give the expected product including the correct stereochemistry. If a mixture of products is formed, then show all products. Where possible indicate which is the major product(s). In addition, indicate what mechanisms are operative ( $S_N1$ ,  $S_N2$ , E1, E2 etc.). If no reaction occurs, then state a reason why this is the case.

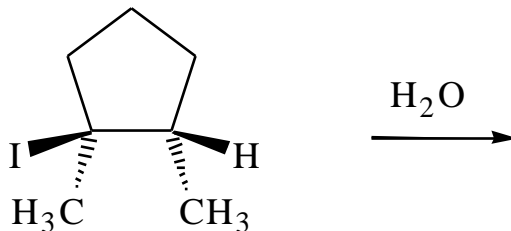
a)



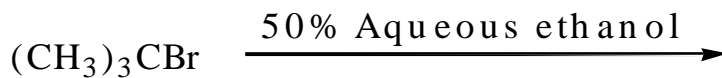
b)



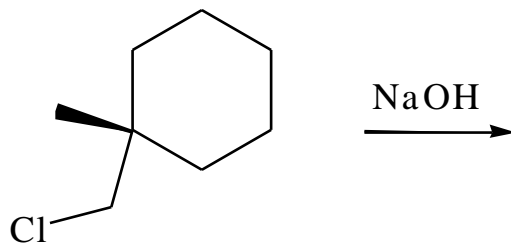
c)



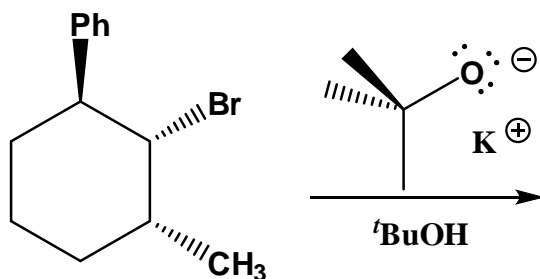
d)



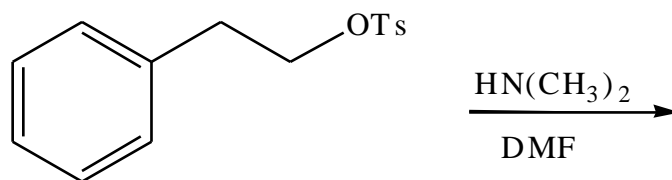
e)



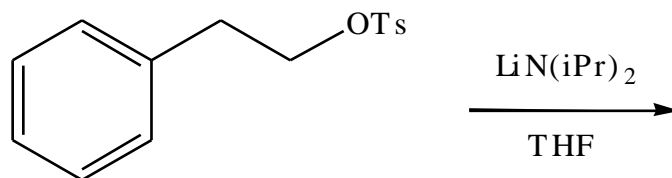
f)



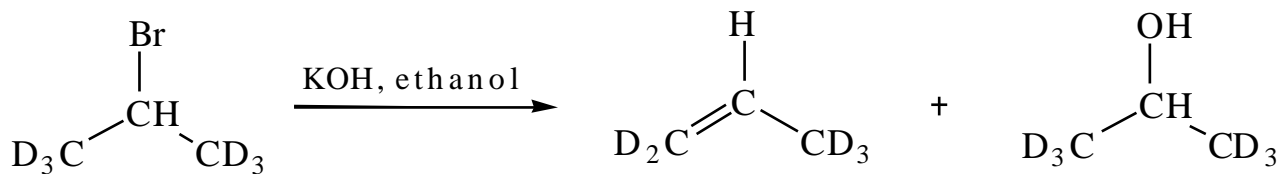
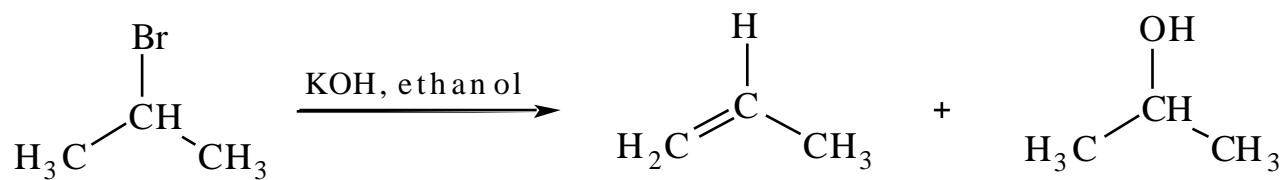
g)



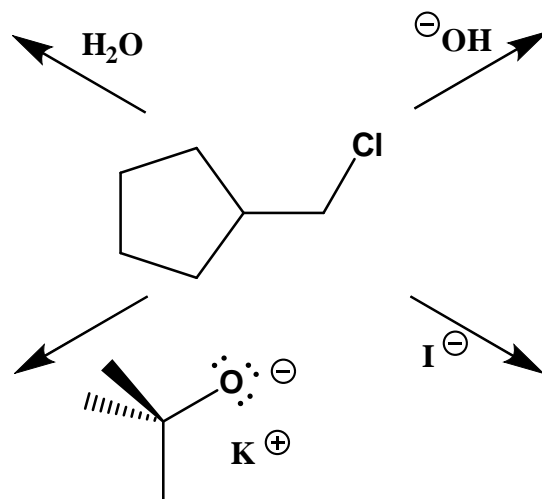
h)



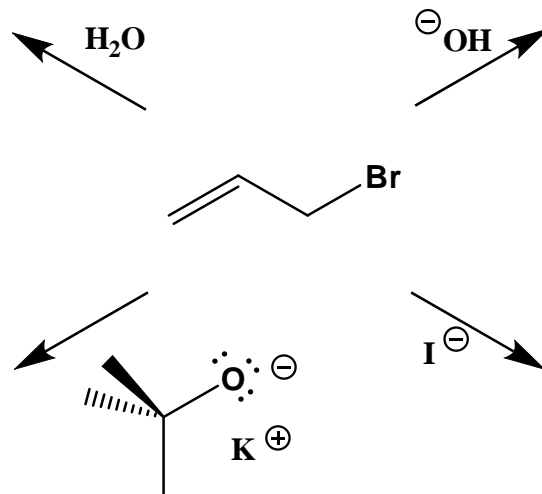
5. The carbon-deuterium bond is stronger than the regular C–H bond. In the two reactions shown below, the alcohol product is formed at the same rate in each, while the alkene product is formed more slowly in the second reaction. Explain.



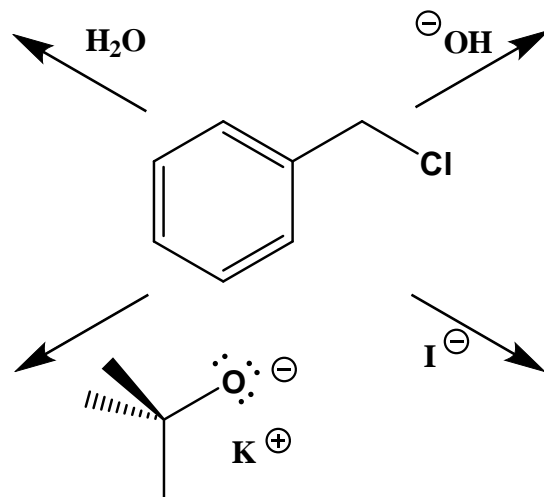
6. The following substrate is a 1° alkyl halide and can undergo either an S<sub>N</sub>2 or E2 reaction. Reaction of this substrate with the four different bases/nucleophiles shown gives different results: no reaction, E2 predominantly, S<sub>N</sub>2 only or E2 and S<sub>N</sub>2. Classify the base/nucleophile in each case (strong or weak, base and/or nucleophile) and match the outcome with the reaction.



7. If the substrate is allyl bromide things change quite significantly. Why, what are the products, and what mechanisms are operative?



8. What does benzyl chloride have in common with the substrate in Question 7? What key difference does it have that leads to a different outcome in one reaction?



9. Which one of the following reactions gives a greater proportion of the E2 product? Why?

