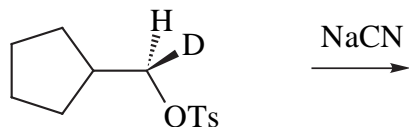
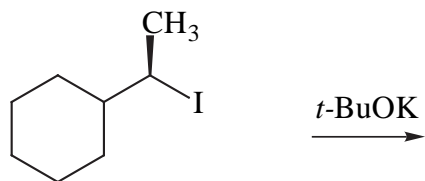


1. (4 pts. each, 24 pts. total) Draw the *major* product of each of the following reactions. If no reaction is expected to occur, write "No reaction." Be sure to indicate the stereochemistry of the product, if appropriate. (A mixture of configurations should be indicated with a squiggly bond \sim to one of the groups attached to the stereogenic C atom.)

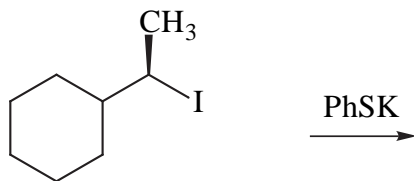
(a)



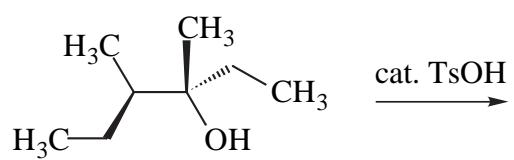
(b)



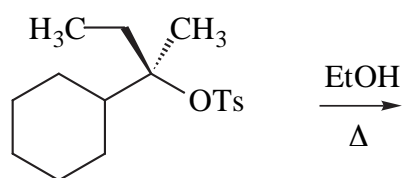
(c)



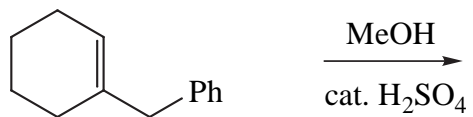
(d) (TsOH is a strong acid.)



(e)

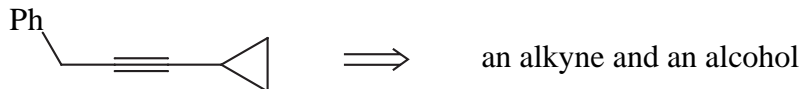


(f)

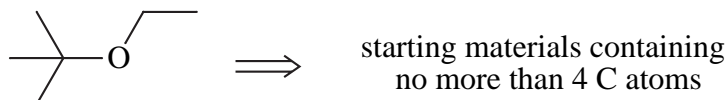


2. (16 pts. each, 32 pts. total) Design syntheses of each of the following compounds from the indicated starting materials. Show all reagents required for each transformation. You are advised to conduct a retrosynthetic analysis before working in the forward direction. ***Either synthesis may require more than one step.***

(a)

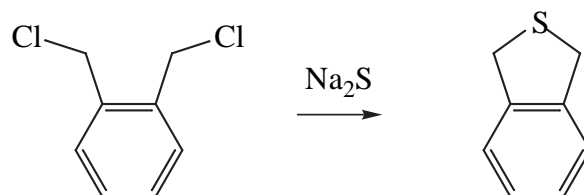


(b)

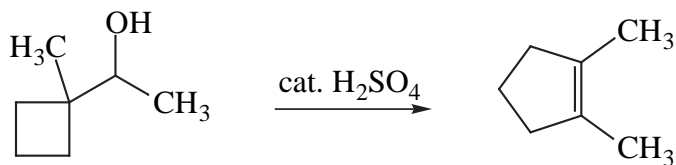


3. (24 pts. total) Draw reasonable mechanisms for each of the following reactions. Use the curved arrow convention to show the movement of electrons. *Remember to obey Grossman's Rule!*

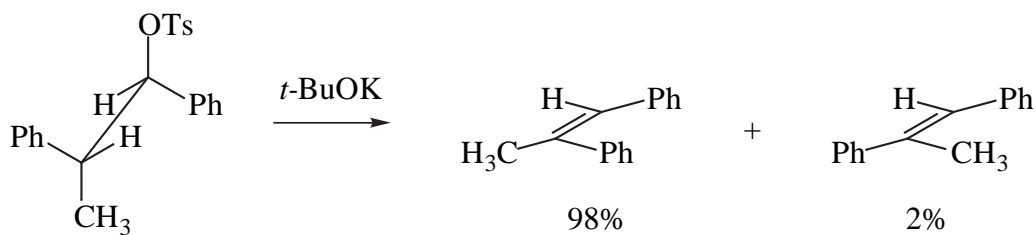
(a) (8 pts.)



(b) (16 pts.)



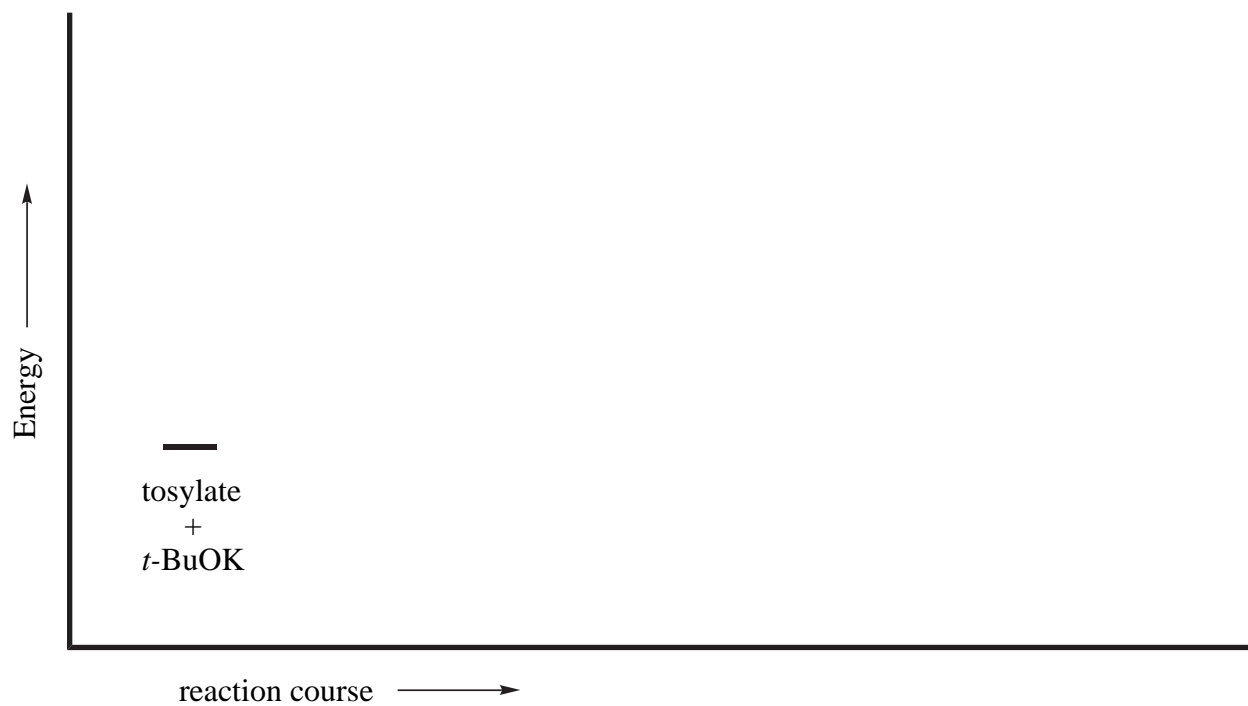
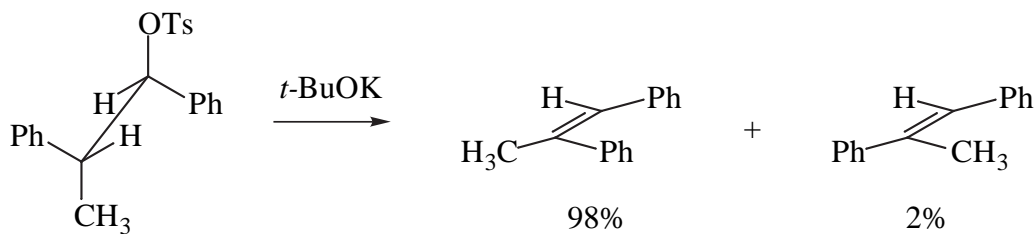
4. (4 pts. each, 12 pts. total) When the alkyl tosylate shown below is treated with *t*-BuOK, the major elimination product is *not* the one that would be predicted by Zaitsev's rule.



(a) Write an equation that would allow you to determine the difference in energy between the two alkene products. (Show the numbers that you would plug into the equation, but do not solve it.)

(b) Explain clearly and succinctly why Zaitsev's Rule is not followed in this reaction.

- (c) Draw a reaction coordinate diagram (energy vs. reaction course) that illustrates the elimination reaction shown. (It's the same reaction as the one on the previous page.) Clearly label the starting materials, the Zaitsev product, the non-Zaitsev product, and the transition state(s) in your diagram. I've drawn part of the diagram to get you started.



5. (4 pts. each, 8 pts. total) Undergraduate research assistant Sally Humdinger has tried to carry out each of the following reactions, but neither one has worked as written. Clearly and succinctly, explain to her why not.

