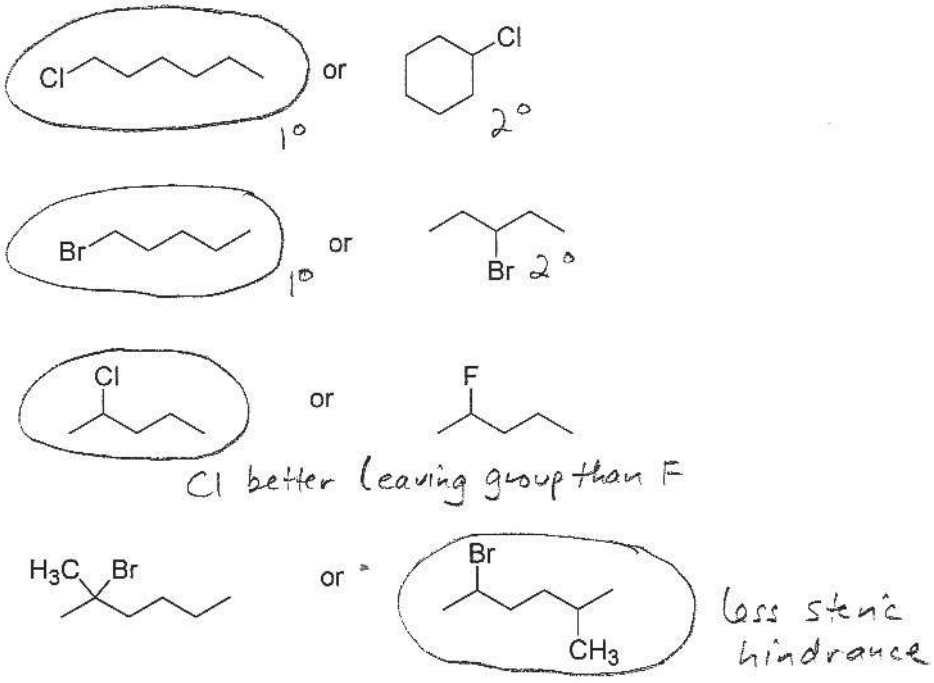
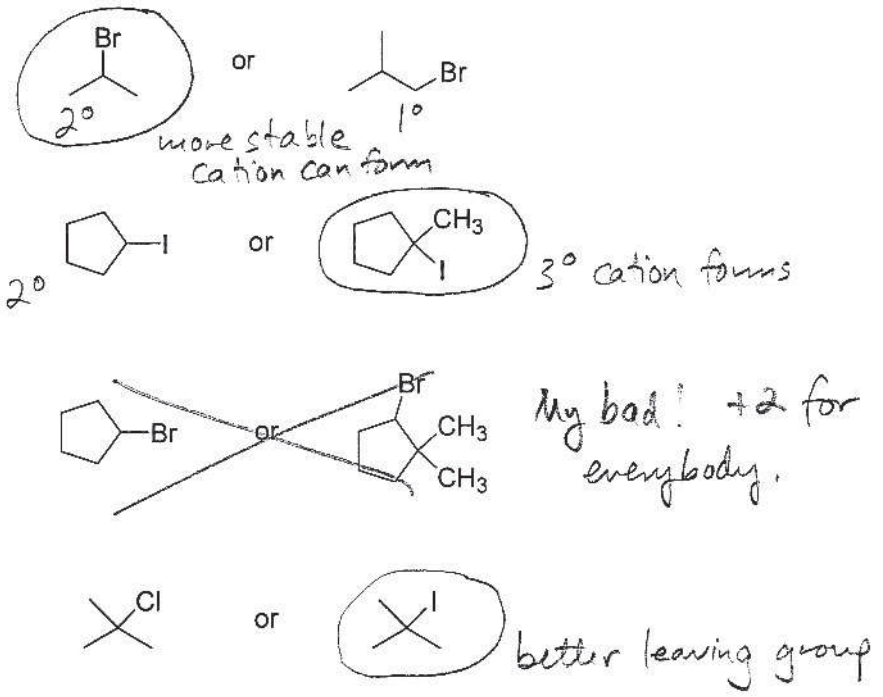
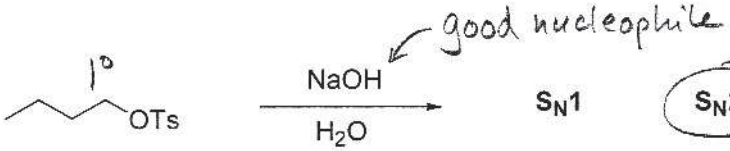
1a. (Problem 8.8, p. 352) Circle the compound in each of the following pairs that reacts with NaI in acetone solvent at the faster rate (8 pts).



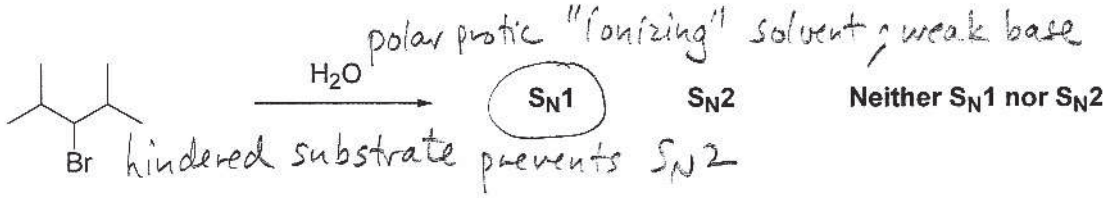
1b. (Problem 8.10, p. 359) Circle the compound in each of the following pairs that reacts at the faster rate in an S_N1 reaction (8 pts).



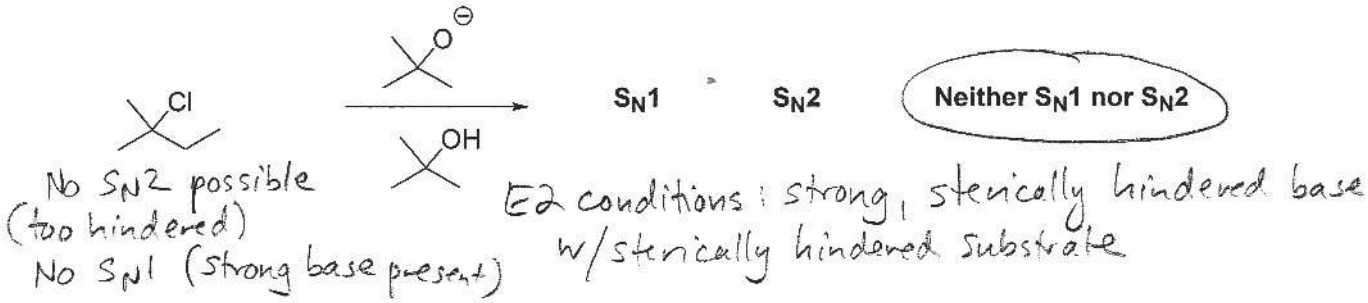
2a. Circle the appropriate response for each reaction to indicate whether each of the following sets of reaction conditions would permit an S_N1 mechanism, an S_N2 mechanism, or neither of these two mechanisms (12 pts).



S_N1 **S_N2** **Neither S_N1 nor S_N2**



S_N1 **S_N2** **Neither S_N1 nor S_N2**



2b. Which of the following steps is the rate-determining step in an S_N1 reaction? Circle it (4 pts).

a. 

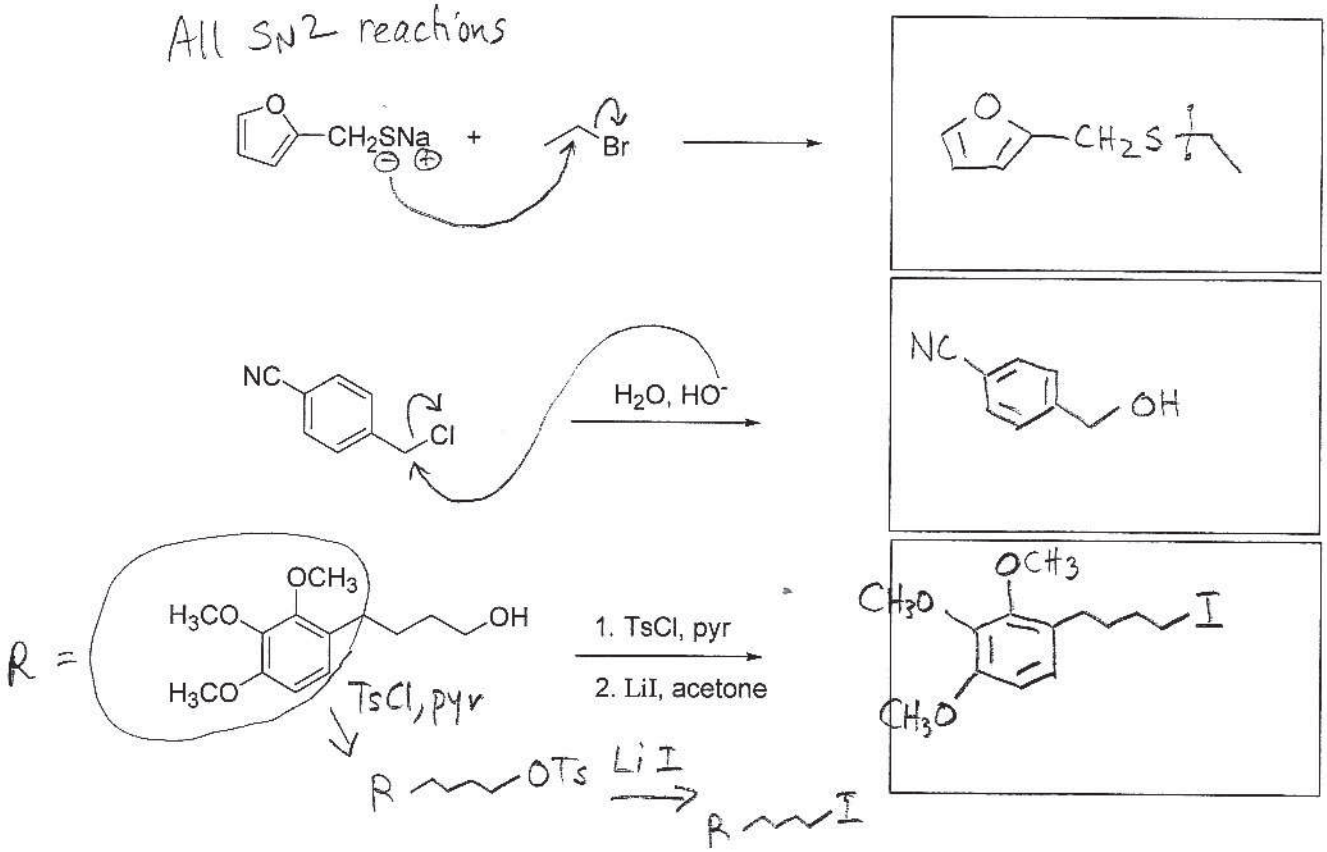
b. 

Carbocation formation is rate-determining

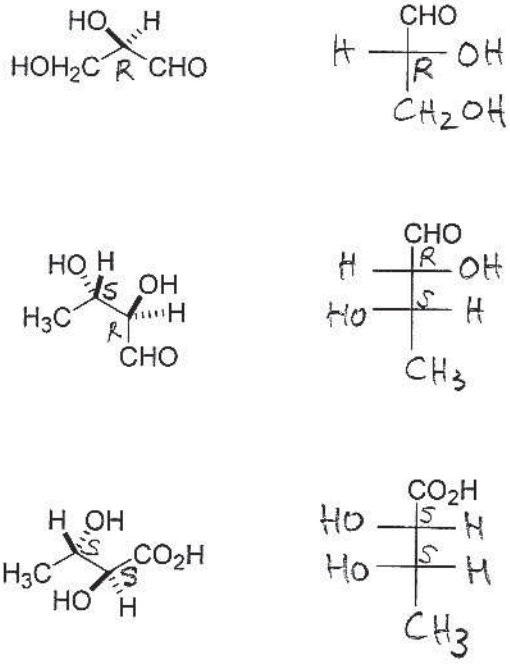
c. 

d. 

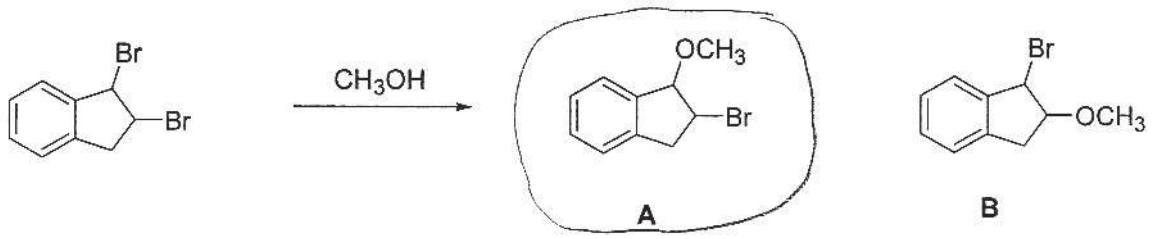
3a. (Problem 8.20, p. 376) Predict the products of the following reactions. (12 pts).



3b) Draw a Fischer projection for each of the following structures using the template at the right. (I've put in the correct carbon at the top of each template to get you started.) (12 pts)

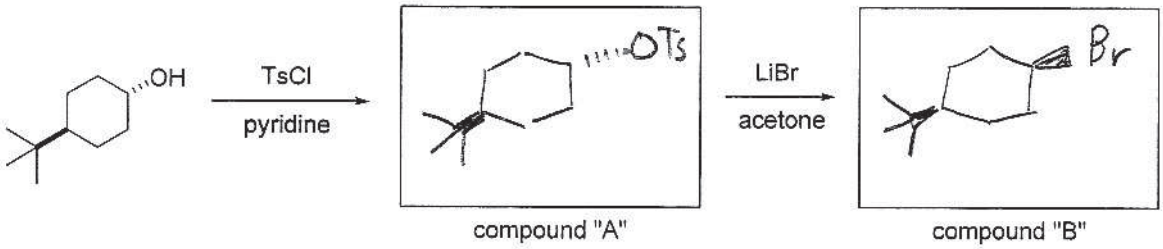


4a) When the compound shown at left is dissolved in methanol, only one of the products shown actually forms. Which is it, **A** or **B**? Circle it. (6 pts)

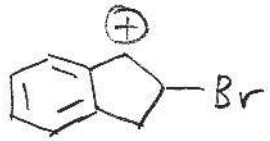


pathway to A goes via a benzylic carbocation stabilized by resonance (see below) unlike pathway to B

4b) (Problem 8.35, p. 376) Give the structures, including stereochemistry, of compounds A and B in the following sequence of reactions (6 pts).

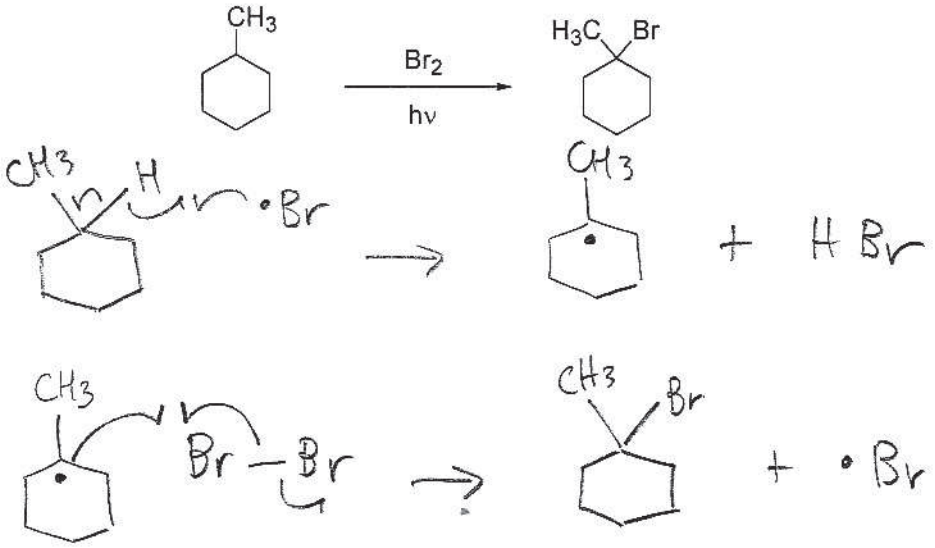


A:

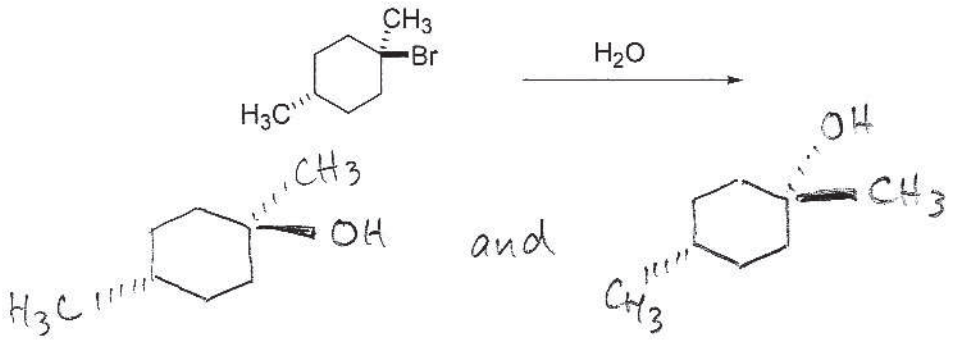


benzylic cation – stabilized by resonance, and since this is an endothermic step (and rate-determining) the ‡ will resemble this intermediate structurally + energetically (Hammond's postulate) → lower E_a, faster rate than B, therefore favored.

5a. Draw an arrow-pushing mechanism showing the two **propagation** steps in the following transformation. Show all bonds, necessary electrons, non-zero formal charges and arrows clearly to receive full credit (8 pts).



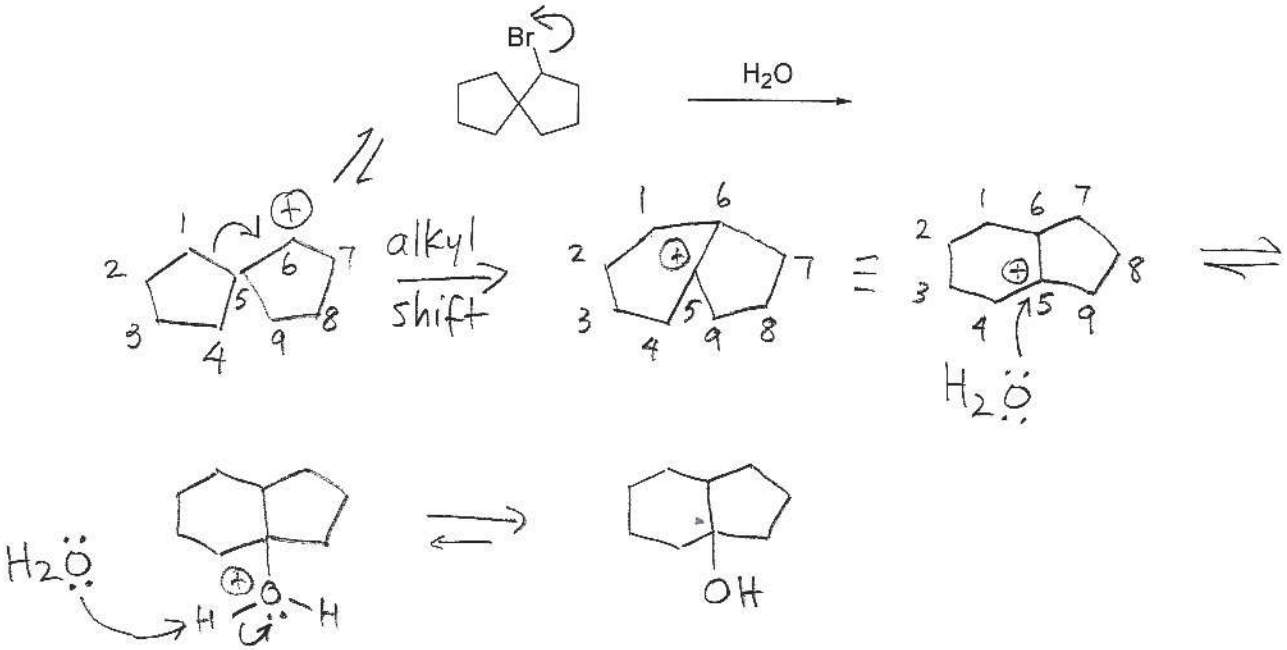
5b. When *cis*-1,4-dimethylcyclohexylbromide is dissolved in water, two stereoisomeric products are formed. Draw the structures of these two products, showing stereochemistry using wedge-and-dash notation (6 pts).



5c. Indicate the stereochemical relationship of the two products in 5b by circling the correct word below (2 pts).

Enantiomers **Diastereomers** **Constitutional isomers**

6. Predict the product of the following substitution reaction and draw an arrow-pushing mechanism for its formation. Show all bonds, necessary electrons, non-zero formal charges and arrows clearly to receive full credit (8 pts).



6b. (Problem 8.36, p. 376) Suggest a reasonable series of reactions to convert *trans*-2-methylcyclopentanol to *cis*-2-methylcyclopentyl acetate (8 pts).

trans-2-methylcyclopentanol

cis-2-methylcyclopentylacetate