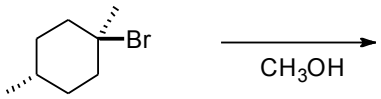
CHM 2120
Blackboard problem set 1

In this assignment:
- S_N1 reactions
- E1 reactions
- E2 reactions

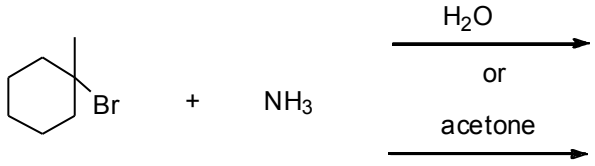
1. Predict the S_N1 product and write the mechanism of the following reaction.



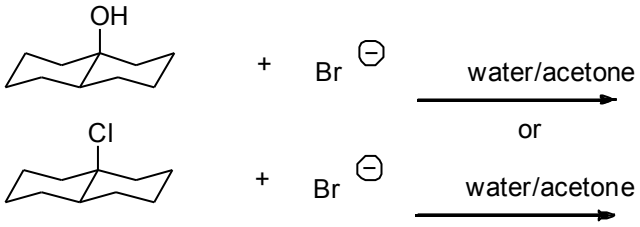
2. a) Predict the S_N1 product of the reaction of $(CH_3)_3CCl$ with 1-cyclohexylmethanol.
   b) Write a mechanism for the reaction.
   c) Give two ways in which the reaction could be accelerated.
   d) If Ph_3CCl is used in place of $(CH_3)_3CCl$, what would be the effect on the reaction rate? Explain.

3. For the following, predict which set of reaction conditions will give the fastest reaction. Justify your choice.

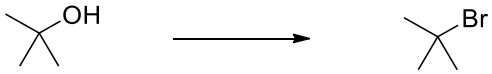
a)



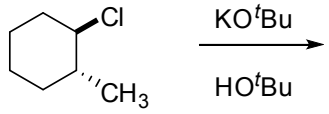
b)

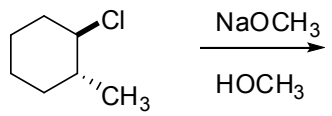


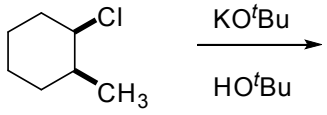
4. Show how the following transformation could be achieved. Give reagents and solvents. Note: you are not responsible for this question for midterm 1.

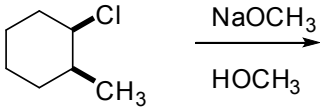


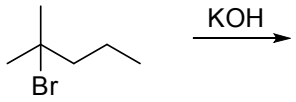
5. Predict all the elimination products of each of the following reactions. Identify the major and minor products. Give a mechanism for parts a and b.

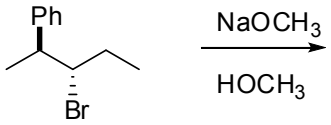
a. 

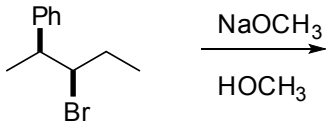
b. 

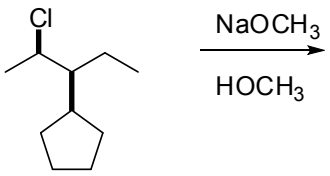
c. 

d. 

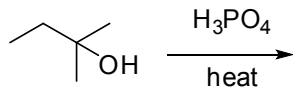
e. 

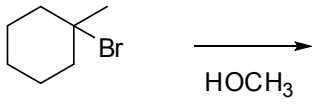
f. 

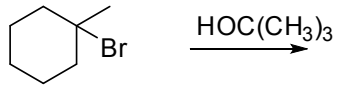
g. 

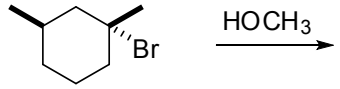
h. 

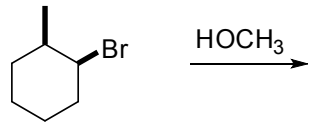
6. Predict the products of elimination for the following compounds. Predict the relative amounts of each product.

a) 

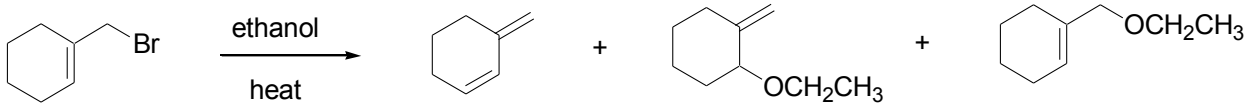
b) 

c) 

d) 

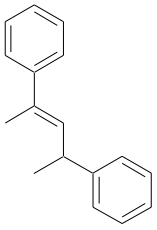
e) 

7. When 1-bromomethylcylcohexene is heated in ethanol, three products are observed. Give mechanisms to account for each product.



8. a) Design an alkyl halide that will give *only* 2, 4-diphenyl-2-pentene upon treatment with potassium tert-butoxide (a strong hindered base).

b) What relative stereochemistry is required in your alkyl halide so that only the following stereoisomer of the product is formed?



9. When 2-bromo-3-phenylbutane is treated with sodium methoxide, alkenes result in addition to the substitution product. Note: you are not responsible for the SN2 reaction for midterm 1.

a) Draw a mechanism for the reaction showing the major and minor products. Clearly indicate the source of each product (mechanism)

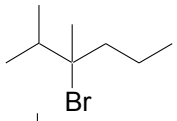
b) When one pure diastereomer of the starting material reacts, one pure isomer of the major product results. Predict which diastereomer will produce the isomer that has the methyl groups *cis*.

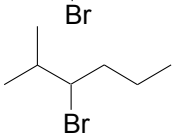
c) Draw a Newman projection of the transition state to justify your choice in part b.

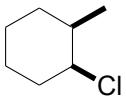
d) Draw a Newman projection of the transition state to show the formation of the *trans* isomer from the other diastereomer.

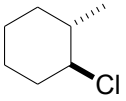
e) Predict the stereochemistry of the product produced from the enantiomer of part b.

10. Predict the elimination products that result when the following are heated in alcoholic KOH. When more than one product is possible, predict the relative amounts.

a) 

b) 

c) 

d) 

(Hint: for parts c and d build models)

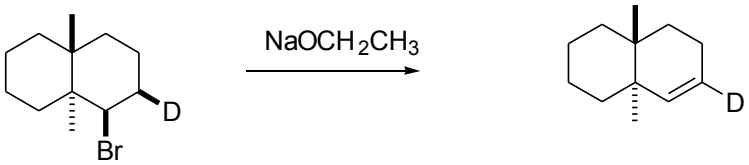
11. Draw mechanisms and energy diagrams for the following reactions. Note: you are not responsible for the S_N2 reaction (i.e., parts b and c) for midterm 1.

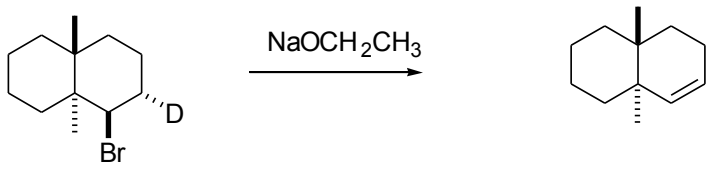
a) $(CH_3)_3CCl + CH_3NH_2$

b) $(CH_3)_2CHCH_2Br + KOH$

c) $BrCH_2CH_2CH_2CH_2OH \xrightarrow{heat}$

12. Explain the following result:





Note: D = deuterium, an isotope of hydrogen

Hint: build models

13. Consider the reaction shown below. Will it proceed by substitution or by elimination? What factors determine the most likely mechanism? Write the expected product and the mechanism by which it forms.