CHEMISTRY 241 Section 004
EXAMINATION II
TUESDAY, November 22, 2005
10:30 - 11:50 AM
Professor William P. Dailey

NAME:_____

Student ID number :_____

QUESTIONS	POINTS	SCORE
1.	9	_____
2.	10	_____
3.	12	_____
4.	10	_____
5.	20	_____
6.	16	_____
7.	15	_____
8.	16	_____
9.	27	_____
10.	15	_____
	TOTAL	_____

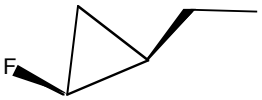
READ ALL QUESTIONS CAREFULLY BEFORE ANSWERING THEM.
BE SURE TO INDICATE STEREOCHEMISTRY IF APPROPRIATE!!

1. (9 points) Draw structural representations of each of the following molecules. Be sure that your structure shows the configuration at each stereocenter.

a. (S)-3-methylpentane

achiral - I goofed

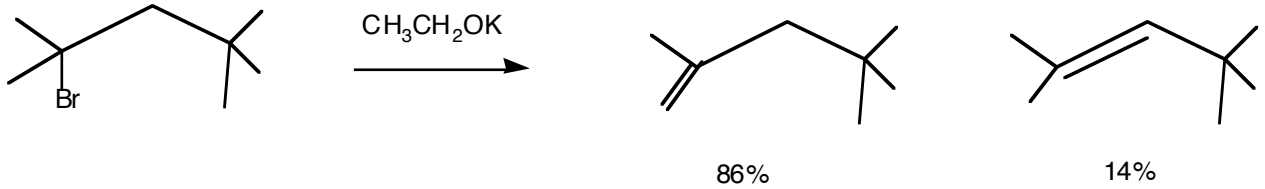
b. (1S, 2R)-1-Ethyl-2-fluorocyclopropane



c. (2R, 3S)- 2,3-Dichloro-2,3-dimethylbutane

achiral again!!! Not enough coffee

2. (10 Points) An **apparent** exception to the Saytzeff rule can be found in the elimination of 2-bromo-2,4,4-trimethylpentane, which reacts with potassium ethoxide to yield an alkene mixture containing 86 percent 2,4,4-trimethyl-1-pentene and 14 percent 2,4,4,trimethyl-2-pentene. Draw out the reaction and the products (No mechanism needed). Given that the heats of hydrogenation of the two alkenes are -27.2 and -28.4 kcal/mol, respectively, suggest an explanation for the observation that the major alkene is the one with the less highly substituted double bond. Clearly explain why this should NOT be considered an exception to the Saytzeff rule. (Hint: What is the basis of the Saytzeff rule?)

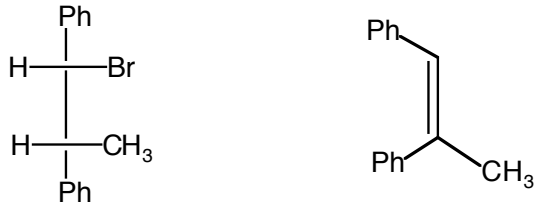


Hydrogenation of both alkenes yields the same product, so the difference in enthalpies of hydrogenation is equal to the difference in enthalpy between the two compounds. The less highly substituted compound is lower in energy (less exothermic hydrogenation reaction) by 1.2 kcal/mol. Since the Saytzeff rule is based on producing more of the thermodynamic product (which is usually the more highly substituted alkene), this reaction actually is consistent with that.

3. (12 Points) Write the products of E2 elimination for each of the following isomeric halogenated compounds.

A.

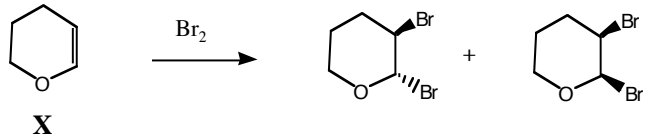
B.

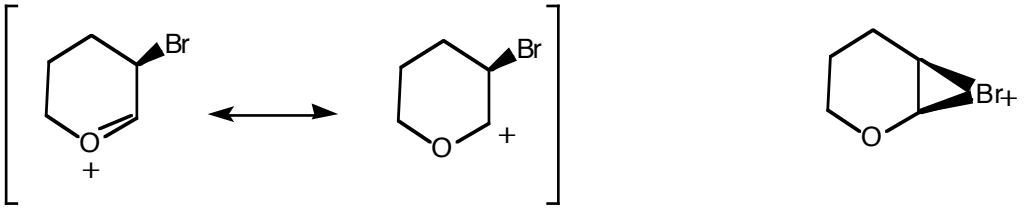


One of these compounds undergoes elimination at a rate fifty times as fast as the other. Which one is it? Why?

A reacts faster because the two phenyl groups have less steric interaction in the transition state leading to product.

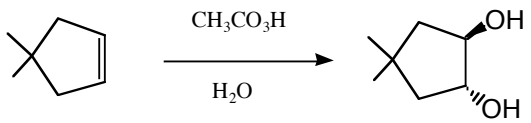
4. (10 points) In contrast to most examples, the reaction of bromine with alkene **X** leads to a mixture of cis and trans dibromo compounds. Explain why this is so.

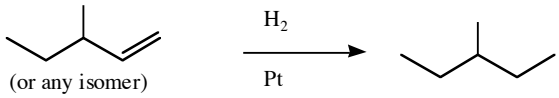


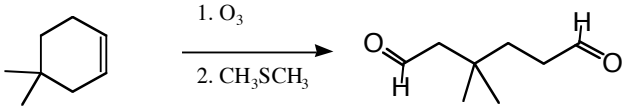


The oxygen lone pair can better stabilize the carbocation, so the molecule doesn't have a bridge bromonium ion like most alkenes.

5. (20 points) Draw the structure of the alkene **containing only carbon and hydrogen** and give the reagent(s) that would produce **ONLY** the following as organic products.

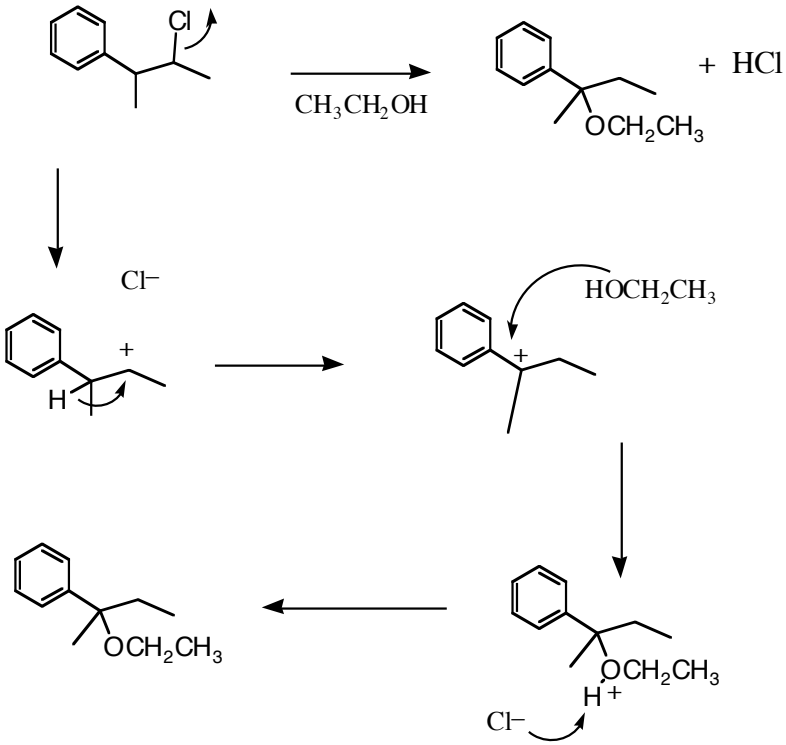




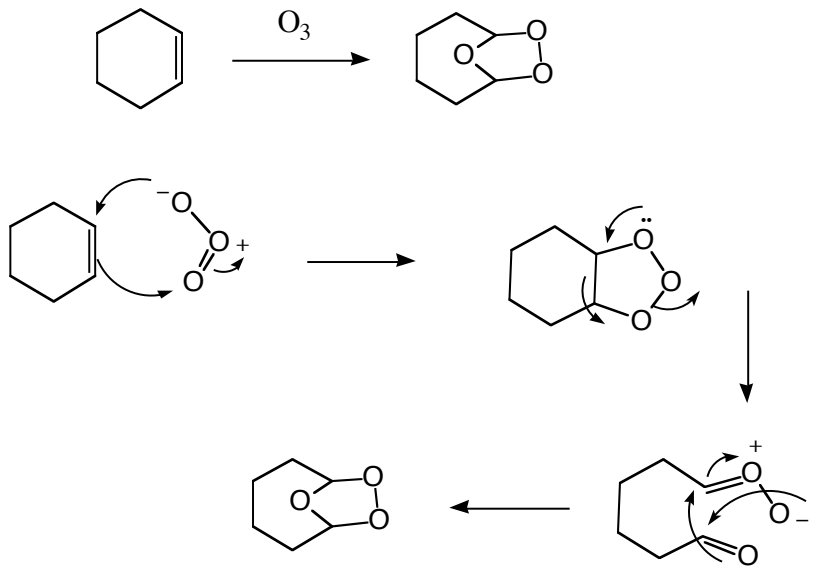


6. (16 points) Write step by step arrow pushing mechanisms for the following reactions.

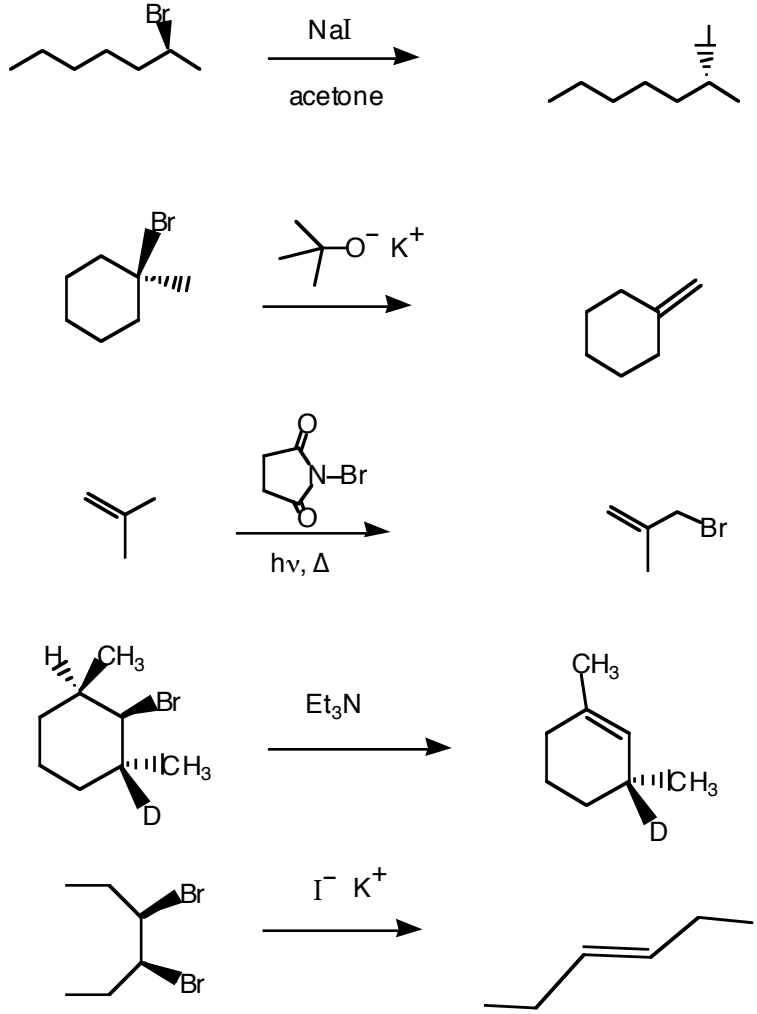
a).



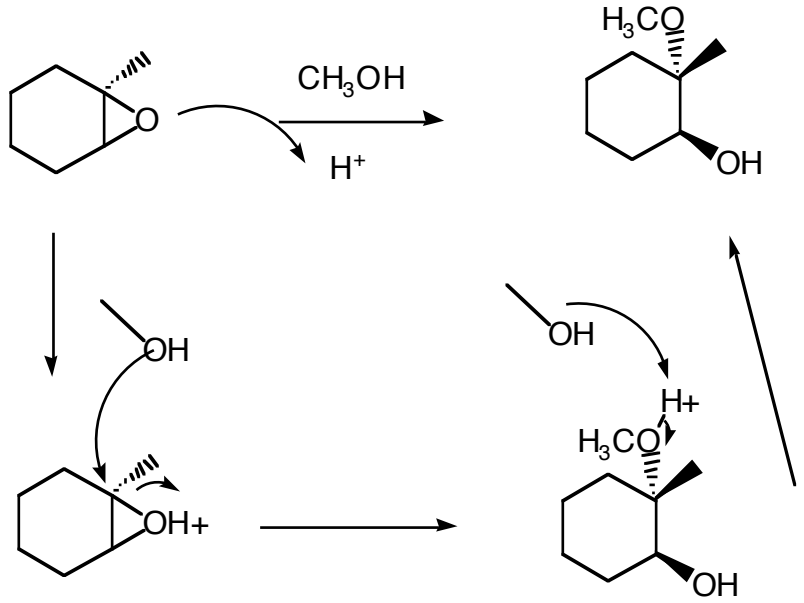
b.

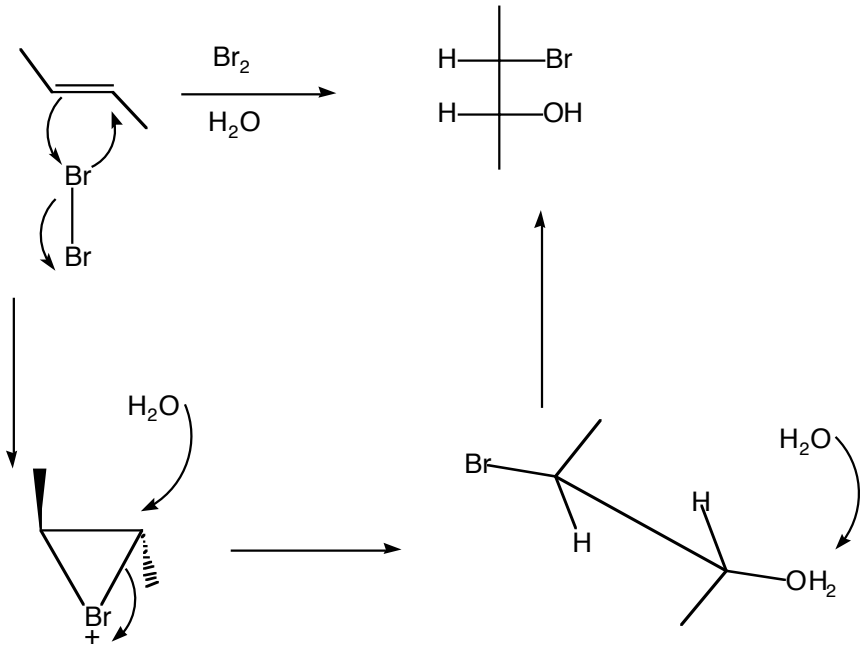


7. (15 points) Complete the following reactions. If more than one product can be formed, predict which one should predominate. If no reaction should occur, then say so.

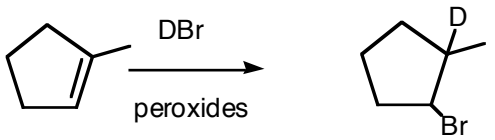


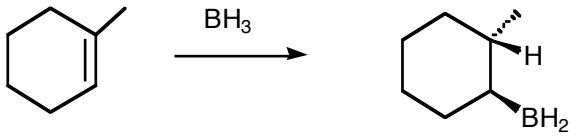
8. (16 Points) For each of the following reactions, predict the major product and propose a mechanism to account for its formation.

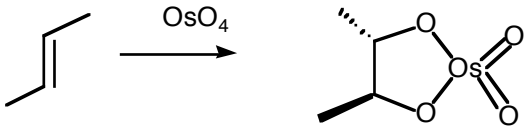


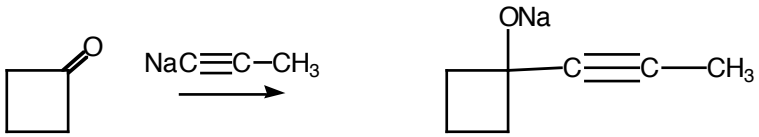


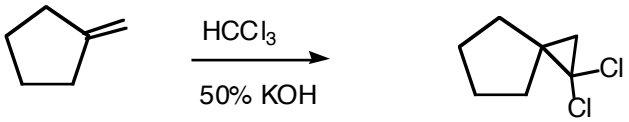
9. (27 Points) Complete the following reactions. If no reaction will occur, then say so. Use ONLY the reagents that are listed.

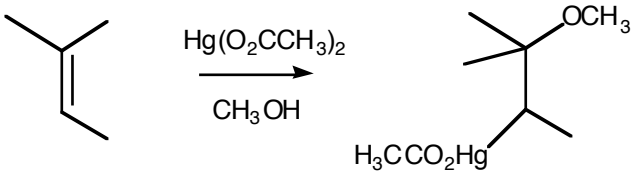


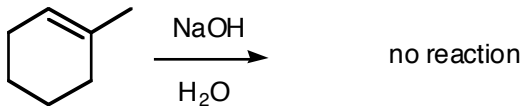


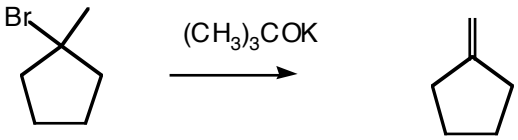


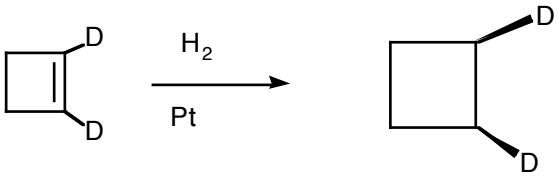












10. (15 Points) **Starting with any alkane containing only carbon and hydrogen and having 6 carbon atoms or less**, propose a synthesis of the following compound. You may use any organic or inorganic reagents. You don't need to show any mechanisms. Just include the reagents and starting material(s).