Test 2
Chemistry 2321-025
March 13, 2001
McMurry, Chapters 6-7

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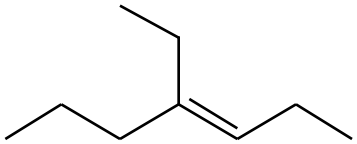
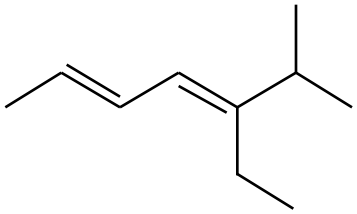
Name (please print)

Part I. Short Answer. (4 points each)

1. The molecular formula of diazepam (Valium) is $C_{16}H_{13}N_2OCl$. Calculate the degree of unsaturation in this compound.

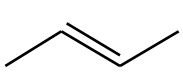
2. Give the IUPAC name for the following compounds:





3. Match each alkene below with the appropriate heat of hydrogenation. Place the letter of the correct answer in the blank underneath the alkene.

a. -125.9 kJ/mol
b. -118.4 kJ/mol
c. -115.5 kJ/mol



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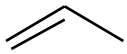

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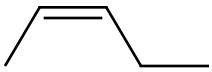

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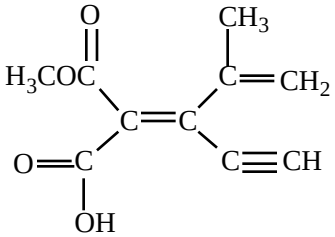
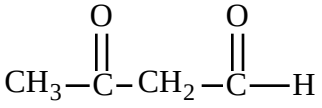
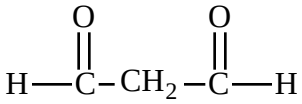
4. Assign an E or Z configuration to the alkene below.



5. Compound A has the formula C_7H_{10}. When Compound A undergoes ozonolysis, the following two products are formed:





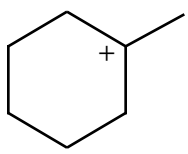
Draw the structure of Compound A.

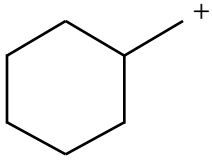
6. Compound B has the formula C_6H_{12}. Describe a simple test that you could use to determine if Compound B possesses a double bond.

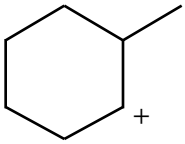
7. Rank the following sets of substituents in order of priority according to the Cahn-Ingold-Prelog sequence rules. That is, put "1" underneath the highest priority substituent, "2" underneath the next highest, etc.

$-CH=CH_2$	$-CH(CH_3)_2$	$-CH_2OCH_3$	$-CHO$
_____	_____	_____	_____

8. Rank the carbocations below in order of increasing stability (least stable = 1; most stable = 3). Place the number corresponding to the carbocation's relative stability in the blank below the structure.







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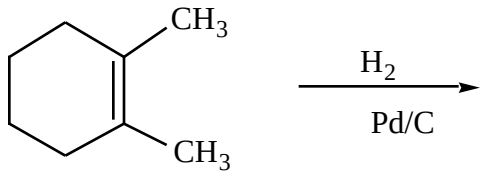
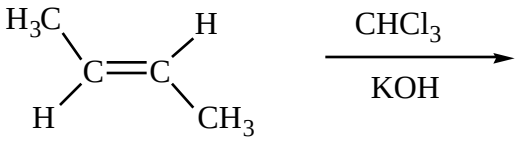
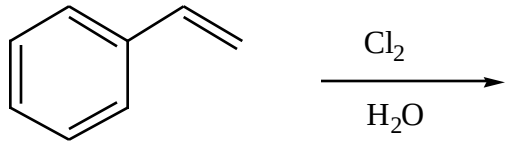
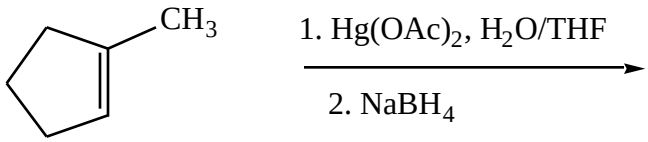
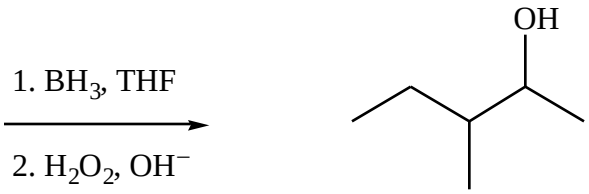
Part II. Reactions. Draw the reactant, the product, or the reagents, as indicated. Clearly indicate the regiochemistry and stereochemistry when appropriate. (4 points each)

1. 

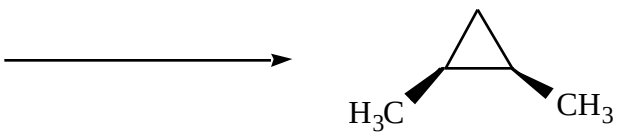
2. 

3. 

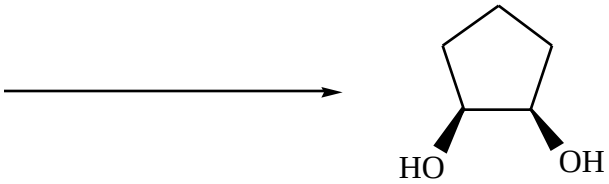
4. 

5. 

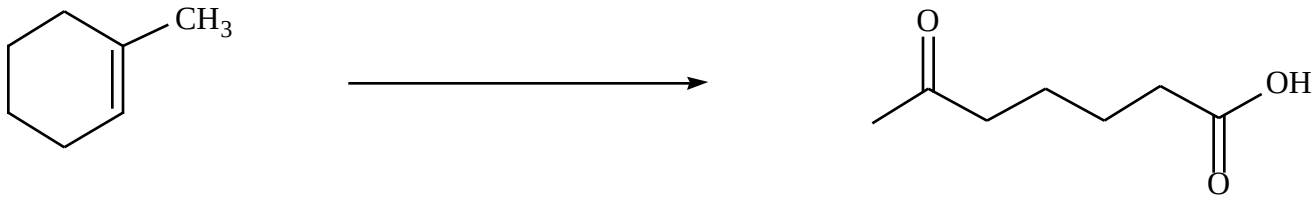
6. Indicate the starting alkene and the appropriate reagents for the Simmons-Smith reaction below:



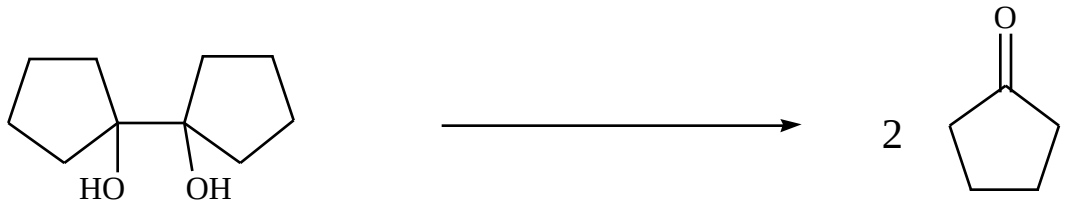
7. Indicate the starting alkene and the appropriate reagents that would yield the following product on hydroxylation:



8. Indicate the appropriate reagents required for the following transformation:



9. Indicate the appropriate reagents required for the following transformation:



10. $CH_3CH_2CH_2CH{=}CH_2 \xrightarrow[KI]{H_3PO_4}$

Part III. Mechanisms. (9 points each)

1. Draw the complete mechanism for the reaction of 1-methylcyclopentene with Br_2 and H_2O.

2. When 3-methylcyclopentene reacts with HBr in ether, one product is 1-bromo-1-methylcyclopentane. Show the complete mechanism for the formation of this product, using the curved arrow formalism.

Part IV. Synthesis. (6 points)

Starting with 1-bromocyclopentane, show how *trans*-1,2-dibromocyclopentane could be synthesized. Show the reagents and intermediate structures, but do not show the mechanism.