

Chemistry 325
Fall, 2008
FINAL EXAMINATION
VERSION B
Thursday, December 18, 2008

The time limit for this examination is 120 minutes. The maximum score possible for this examination is 200 points. You may use molecular models. Where it is important, points are specifically allocated to stereochemistry.

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NAME:

SECTION I. Nomenclature [10 pts]

1. Write a correct name for each of the following compounds [5 pts each; 10 pts]:

(a) 	
(b) 	

2. (a) Draw the structure of *Z*-1-cyclopentyl-1-bromohex-1-ene [5 pts]

(b) Draw the structure of *R*-2-bromo-3-ethylpent-3-ene [5 pts]

(a)	(b)
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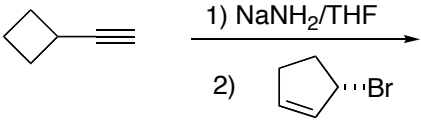
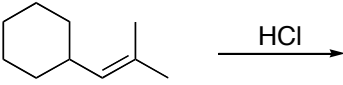
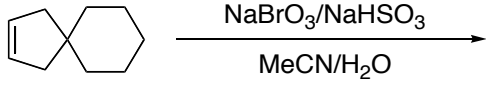
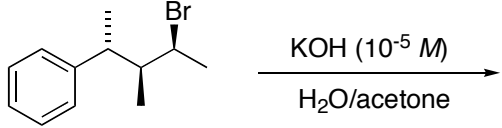
SECTION II. Reactions and Theory [168 pts]

3. (a) Draw the Newman projection of the 3,4-bond of the lowest energy conformation of *meso*-3,4-dimethylhexane. [8 pts.]

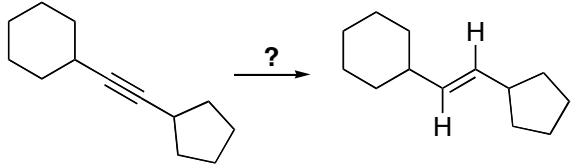
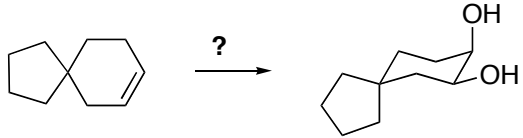
(b) Draw the lowest-energy conformation of *E*-1,3-dibromo-1-methylcyclohexane [8 pts].

(a)	(b)
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4. [5 pts each; 20 pts.] Complete the following reactions by drawing the structure of the major organic product. Where the product is a racemate, draw only one enantiomer of the product.

(a)		
(b)		
(c)		
(d)		

5. [5 pts each; 20 pts] Complete the following reactions by drawing the structure of the starting compound or providing the missing reagent. The molecular formula is given for some missing reactant alkenes. Note that stereochemistry may be important in some of these reactions.

(a)		
(b)		

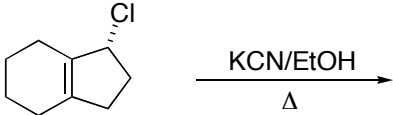
(c)		
(d)		

6. Specify the hybridization of the designated atoms and the shape around the designated atoms in each of the following species [4 pts each; 12 pts].

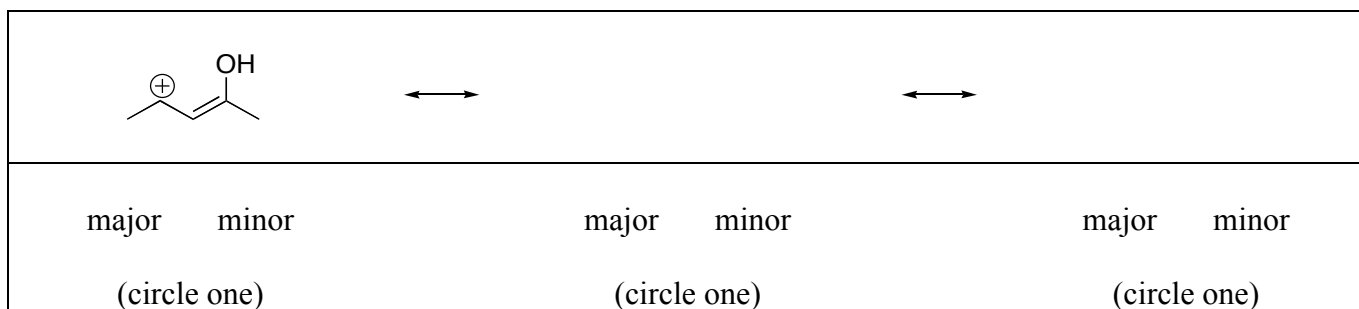
<p>hybridization:</p> <p>shape:</p>	<p>hybridization:</p> <p>shape:</p>	<p>hybridization:</p> <p>shape:</p>
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7. [5 pts each; 20 pts.] Complete the following reactions by drawing the structure of the major organic product. Where the product is a racemate, draw only one enantiomer of the product.

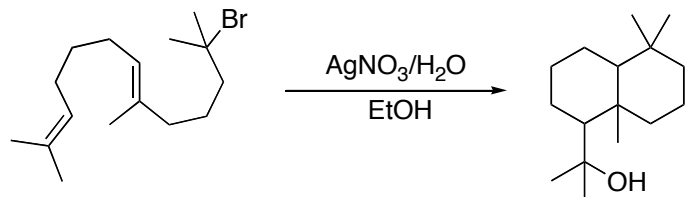
(a)		
(b)		

(c)		
(d)		

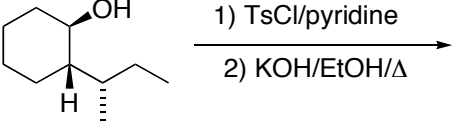
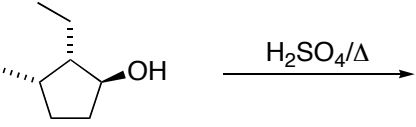
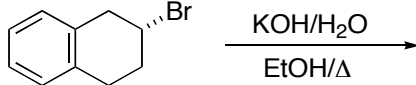
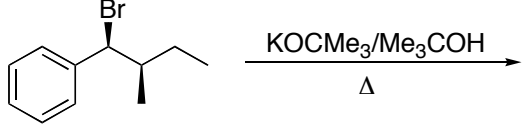
8. The ion below is stabilized by resonance. Draw two additional canonical forms that contribute to the structure of the ion, and designate which are the major and minor contributors (there may be more than one of each). Use curved arrows to indicate the electron movement that converts these contributors into each other [12 pts].



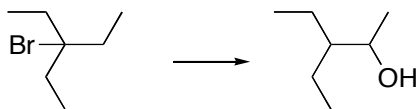
9. [10 pts] Write a reasonable mechanism to account for the following transformation:



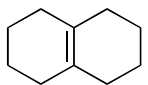
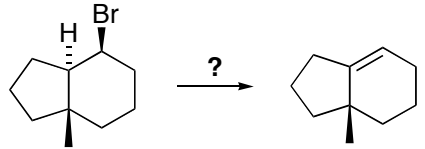
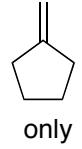
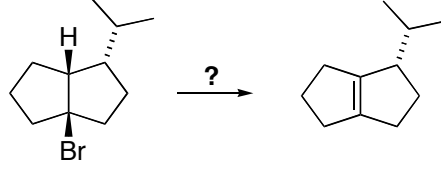
10. [5 pts each; 20 pts.] Complete the following reactions by drawing the structure of the major organic product. Where the product is a racemate, draw only one enantiomer of the product.

(a)		
(b)		
(c)		
(d)		

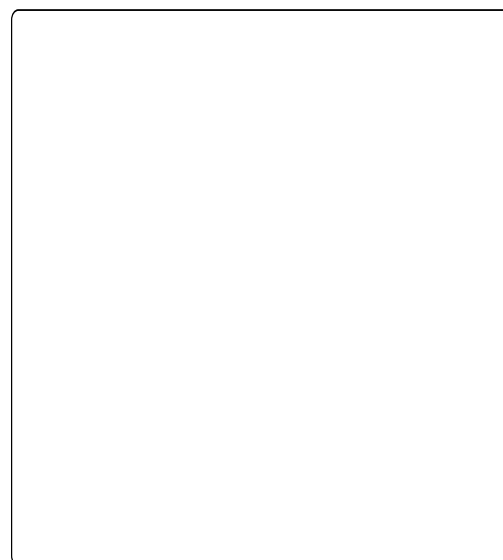
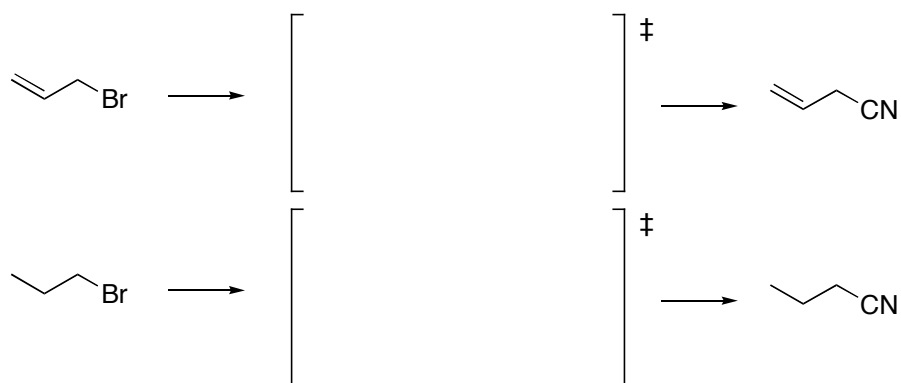
11. Design a sequence of reactions that can be used to carry out the following transformation [10 pts.]



12. [5 pts each; 20 pts] Complete the following reactions by drawing the structure of the starting compound or providing the missing reagent. The molecular formula is given for some missing reactant alkenes. Note that stereochemistry may be important in some of these reactions.

(a)	$C_{10}H_{17}Cl \xrightarrow[\Delta]{KOH/EtOH}$ 	
(b)		
(c)	$C_6H_{11}Br \xrightarrow[\Delta]{KOCMe_3/Me_3COH}$  only	
(d)		

13. [8 pts.] Allyl halides react faster than primary alkyl halides in the S_N2 reaction. Draw the transition states for the S_N2 substitutions of the two alkyl halides below by sodium cyanide, and suggest a reason why the allyl halide should react faster.



SECTION III. Synthesis [12 pts]. Design a reasonable synthesis of 1,2-dicyclopentylethane from hydrocarbons with 5 carbon atoms or less.