

Chem 331, Spring 2006

William Jenks

Name Key

PLEASE ALSO WRITE YOUR NAME ON THE TOP OF THE BACK OF YOUR EXAM

Please check off which recitation section you are registered for:

_____ Monday, 2:10 p.m.

_____ Tuesday, 9:00 a.m.

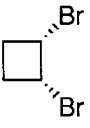
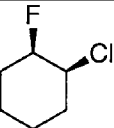
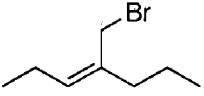
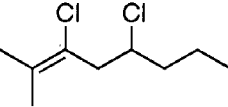
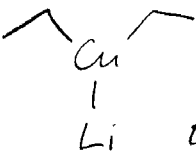
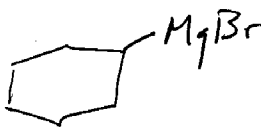
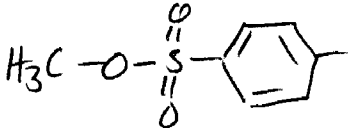

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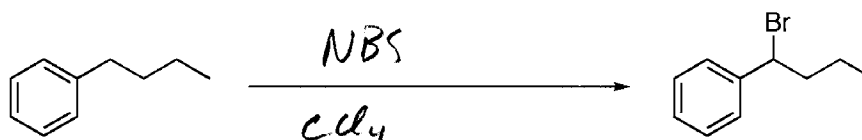
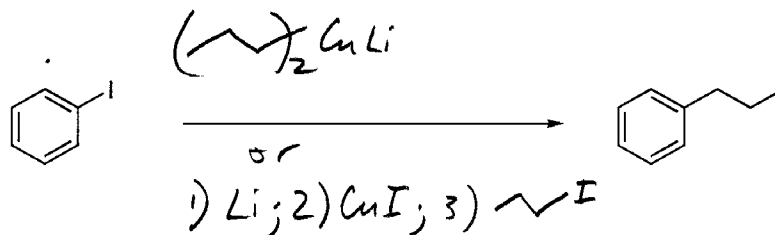
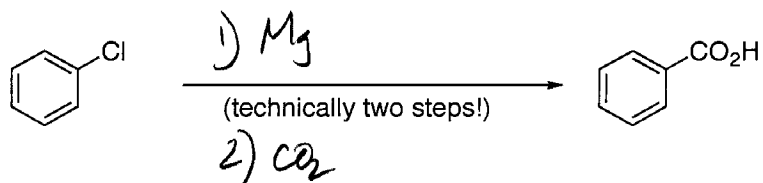
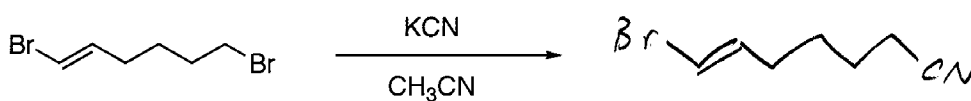
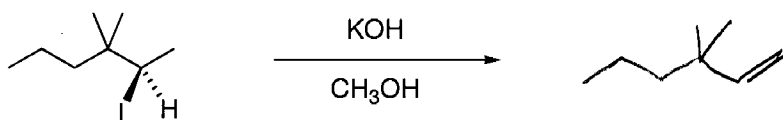
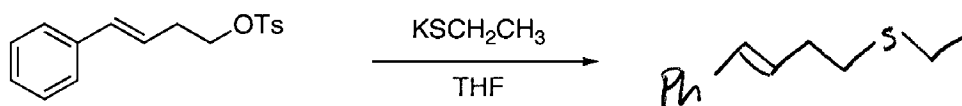
MIDTERM 4
3 April, 2006

Problem (max score)	Score
I (20)	
II (24)	
III (18)	
IV (20)	
V (20)	
Total (102)	

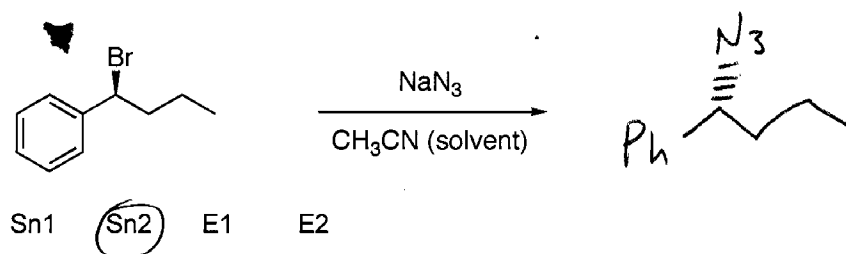
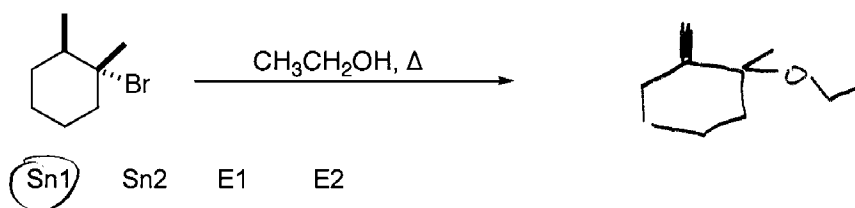
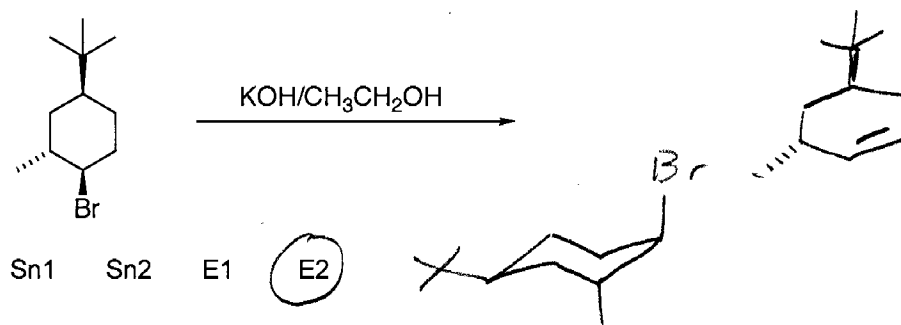
- I. 20 points. Nomenclature. Provide the name or structure, as appropriate. Remember to indicate stereochemistry (e.g., R/S, cis/trans, or E/Z in names and hash/wedge in drawings) as needed.

 <p style="text-align: right;">3 each</p> <p>cis-1,2-dibromocyclobutane</p>	 <p>(1S,2R)-cis-1-chloro-2-fluorocyclohexane ↑ probably not necessary</p>
 <p>(Z)-1-bromo-2-propyl-2-pentene</p>	 <p>3,5-dichloro-2-methyl-2-octene</p>
<p>Draw the structure of the ethyl Gilman reagent</p> <p style="text-align: right;">2 each</p>  <p>Li or $(\text{CH}_3\text{CH}_2)_2\text{CuLi}$</p>	<p>Draw the structure of the Grignard reagent obtained from bromocyclohexane</p> 
<p>Draw the full structure of CH_3OTs (methyl tosylate)</p> 	<p>butyllithium</p> 

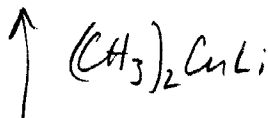
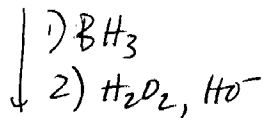
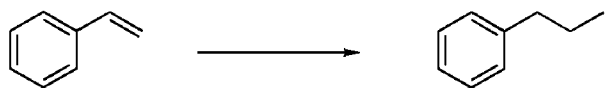
II. 24 points, 4 points each. Provide structures corresponding to the reagents or major organic products, as appropriate. You do not need to indicate small-molecule byproducts like NaCl or H₂O.



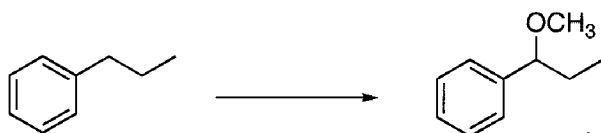
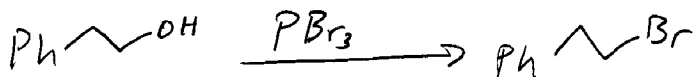
III. 18 points. Selectivity issues: Regiochemistry and Stereochemistry. Each of the reactions below involves a choice of which isomer of a given compound will be obtained. Provide the MAJOR product, including stereochemistry using hash and wedge notation as necessary. To indicate a racemic mixture at a stereogenic site, use a plain "stick" rather than hash or wedge. For each reaction, also indicate the class of the reaction by circling the appropriate designation.



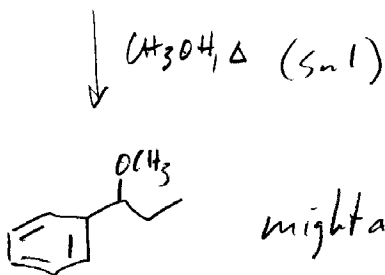
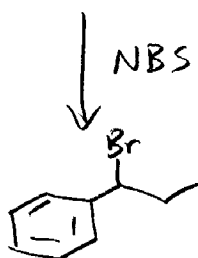
IV. 20 points. Show how the following synthetic conversions can be carried out in a few steps. You may use any common solvents and any reagents containing 3 or fewer carbons.



Other answers possible

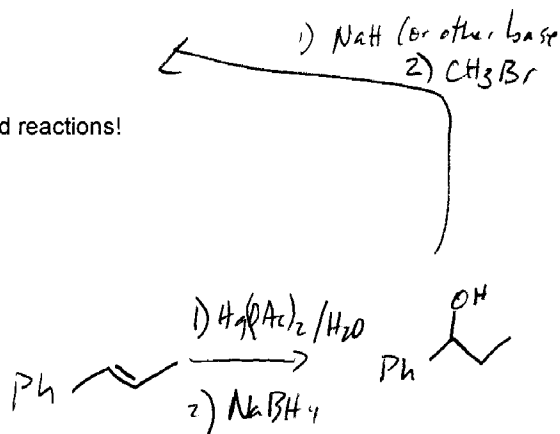


The best answer for this one involves being careful to avoid unintended reactions!

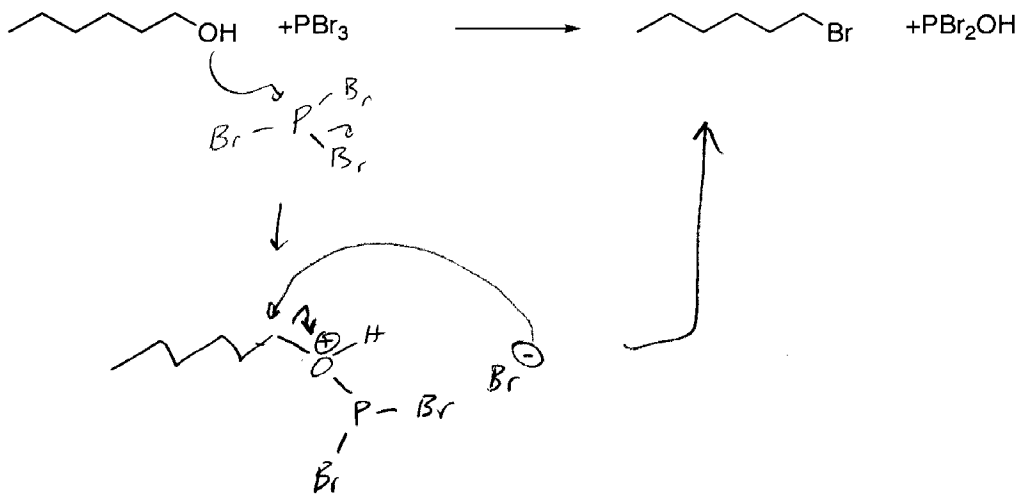


CH_3O^- here might do a lot of elimination (E2)

might also give E1



V. 10 points. Draw a mechanism for the following transformation:



How many Sn1 steps are involved? 0 How many Sn2 steps are involved? 2

10 points. Provide appropriate short answers:

<p>Draw an alkyl bromide that will not undergo Sn2 substitutions.</p> <p>Anything 3° or on sp² carbon</p> <p>eg <chem>CC(C)(C)Br</chem> <chem>C1=CC=CC=C1Br</chem></p>	<p>Circle the better nucleophile in each pair:</p> <p><chem>NH3</chem> vs. <chem>H2O</chem></p> <p><chem>H2O</chem> vs. <chem>HO-</chem></p> <p><chem>CH3O-</chem> vs. <chem>CH3S-</chem></p>
<p>Circle the compound(s) that will not undergo Sn1 substitution reactions</p> <p> </p>	

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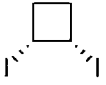
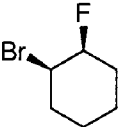
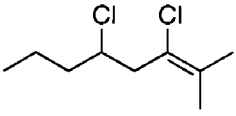
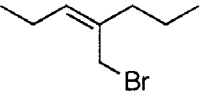
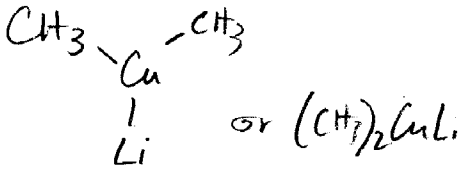

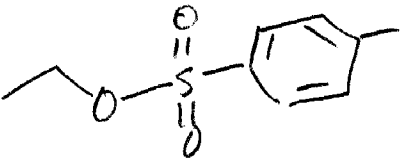

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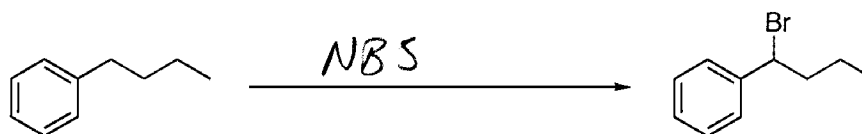
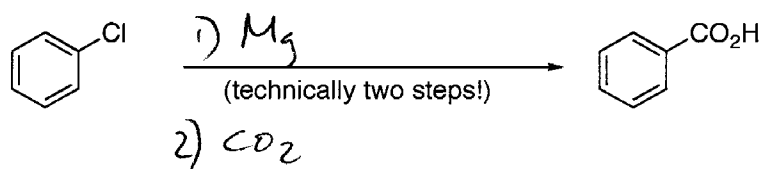
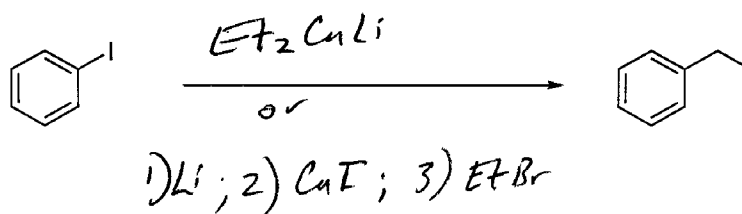
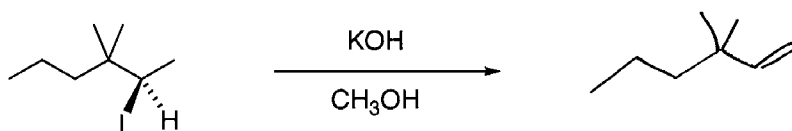
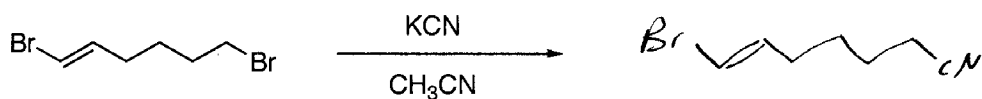
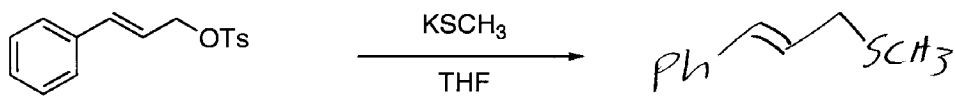
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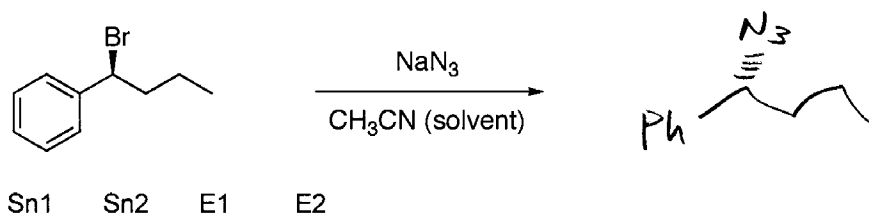
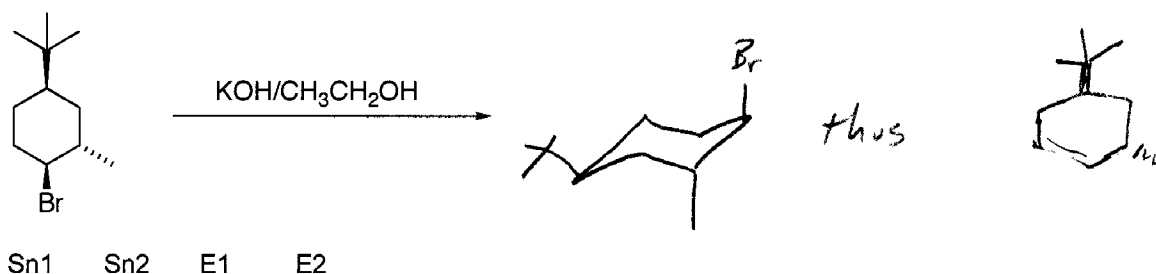
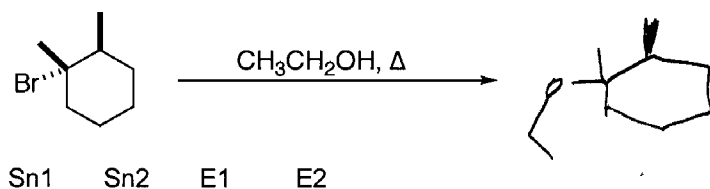
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<p>Draw the structure of the methyl Gilman reagent</p>  <p>$\text{CH}_3-\text{Cu}-\text{CH}_3$ Li or $(\text{CH}_3)_2\text{CuLi}$</p>	<p>Draw the structure of the Grignard reagent obtained from bromocyclopentane</p>  <p>Cyclopentyl-MgBr</p>
<p>Draw the full structure of $\text{CH}_3\text{CH}_2\text{OTs}$ (ethyl tosylate)</p> 	<p>propyllithium</p>  <p>$\text{CH}_3\text{CH}_2\text{CH}_2\text{Li}$</p>

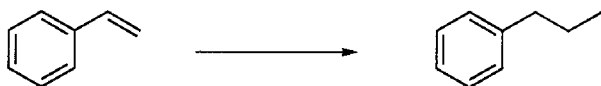
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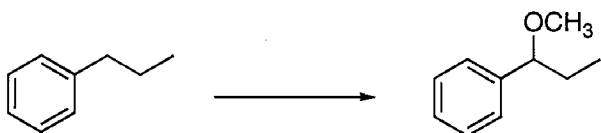
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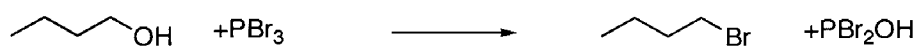


see p. 5



The best answer for this one involves being careful to avoid unintended reactions!

VI. 10 points. Draw a mechanism for the following transformation:



see p. 6

How many $\text{S}_\text{N}1$ steps are involved? _____ How many $\text{S}_\text{N}2$ steps are involved? _____

10 points. Provide appropriate short answers:

Draw an alkyl bromide that will not undergo $\text{S}_\text{N}2$ substitutions.

Circle the better nucleophile in each pair:

NH_3 vs. H_2O

H_2O vs. HO^-

CH_3O^- vs. CH_3S^-

Circle the compound(s) that will not undergo $\text{S}_\text{N}1$ substitution reactions

