CHEM 3371, Spring 2014
Professor Walba
First Hour Exam
February 11, 2014

scores:

1)

2)

3)

4)

5)

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CU Honor Code Pledge: On my honor, as a University of Colorado at Boulder Student, I have neither given nor received unauthorized assistance.

Name (printed): _____

Signature: _____

Recitation TA Name: Thomas Carey

Recitation day and time: _____

This is a closed-book exam. The use of notes, calculators, scratch paper, or cell phones will not be allowed during the exam. You may use models brought in a clear ziplock bag. Please put all you answers on the test. Use the backs of the pages for scratch.

PLEASE read the questions very carefully!

Partial Periodic Table

1A							8A
1 H	2A						2 He
3 Li	4 Be	3A	4A	5A	6A	7A	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
						35 Br	
						53 I	

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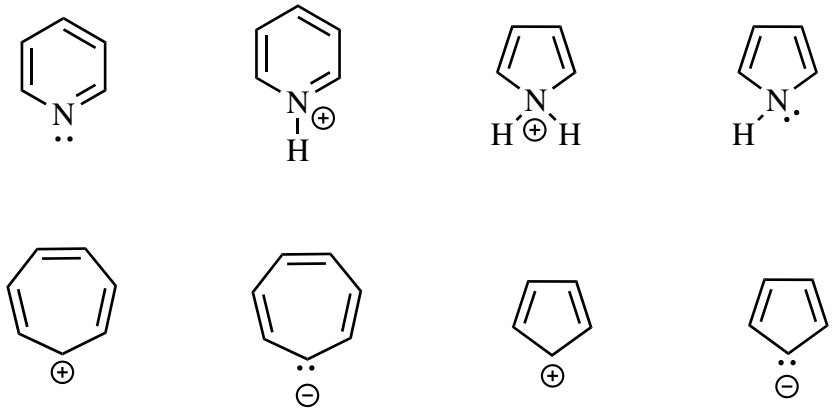
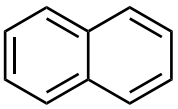
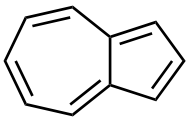
1 (20 pts) a) Circle each of the aromatic compounds in the following list. Following the common convention, H atoms are shown on heteroatoms, but not on carbon atoms.



b) Valence bond structures for the hydrocarbons naphthalene and azulene are given below. Azulene is famous due to its deep blue color (very unusual for a small hydrocarbon). Experiment shows that both naphthalene and azulene are aromatic. Also, naphthalene has no dipole moment, while azulene has a fairly large dipole moment for a hydrocarbon: over 1 Debye.

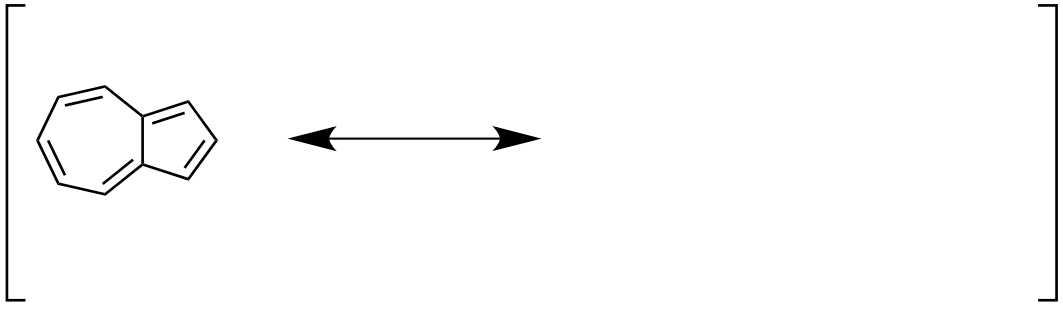


Naphthalene
$\mu = 0$ D



Azulene
$\mu = 1.1$ D

Normally neutral resonance contributors are much more important than contributors with separation of charge. However, azulene actually has charge-separated resonance contributors that ARE important, and give rise to the observed dipole moment. Draw one "charge-separated" resonance contributor to the structure of azulene that indicates which direction the azulene dipole points.



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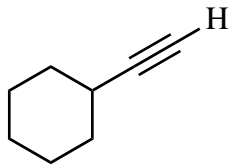
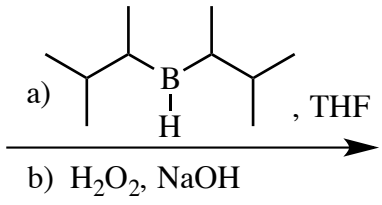
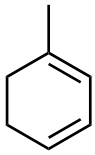
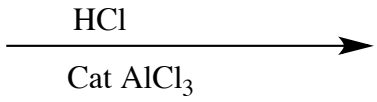
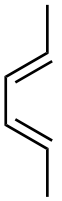
2) (20 pts) Give the single major product for each of the following reactions, carefully showing stereochemistry using wedges and dashes where appropriate. If a racemate is formed, show only one enantiomer and label it "rac."

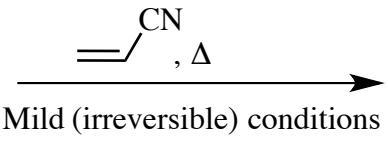
a) 

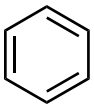


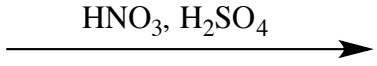
b) 

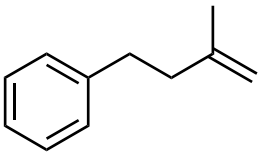


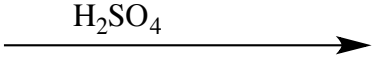
c) 



d) 



e) 



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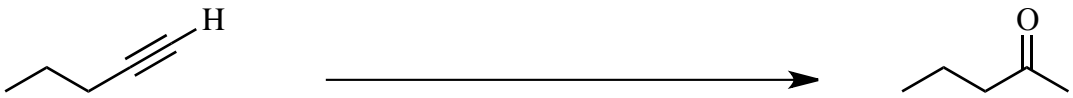
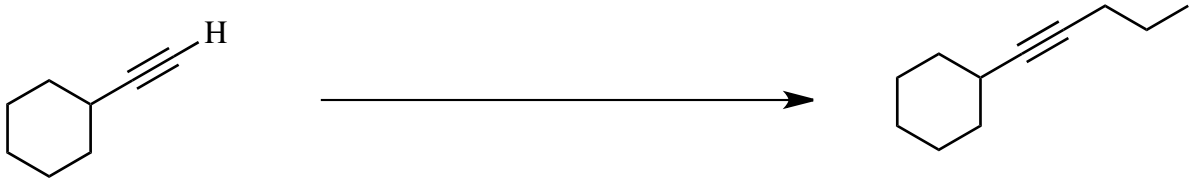
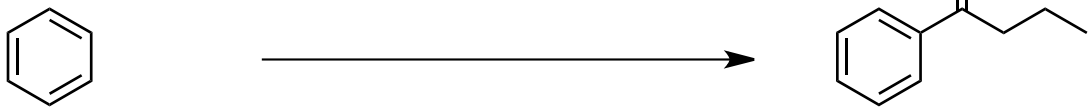
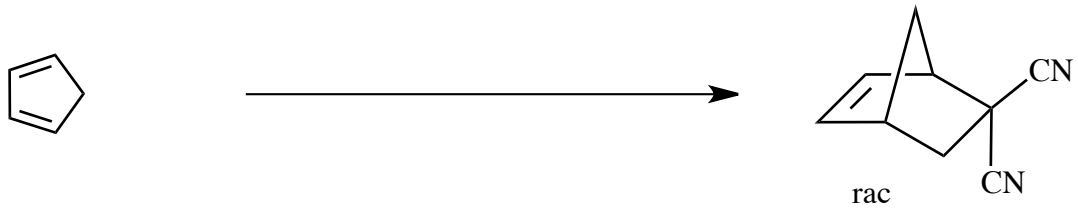
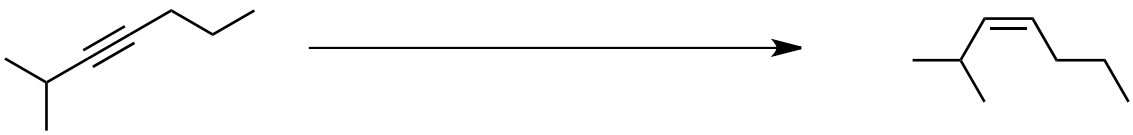
3) (20 pts) Propose reagents for accomplishing each of the following transformations. Make your reactions efficient (i.e. the target product should be the major product). Assume chiral starting materials or products are single pure enantiomers unless they are labeled "rac."

a) 

b) 

c) 

d) 

e) 

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4) (20 pts) Propose an arrow-pushing mechanism for each of the following reactions (continued on next page).

a)

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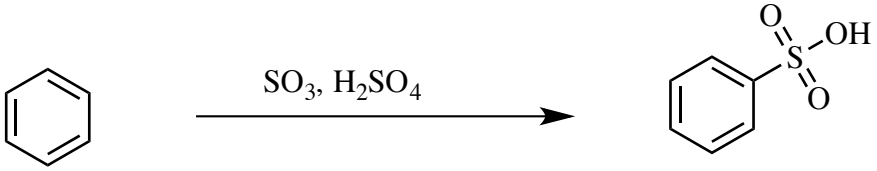
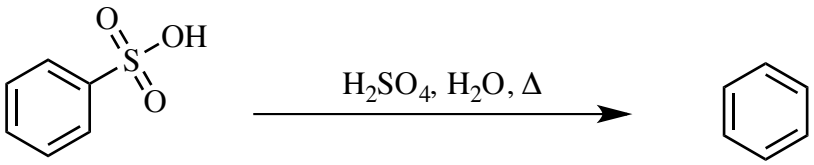
4) – Continued –

b)



c)



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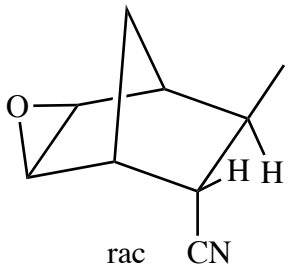
5) (20 pts) Propose a synthesis for each of the following targets. Allowed starting materials include benzene, and/or any other organic molecules containing **five (5) carbons or less**. You may use any necessary inorganic reagents. Try to make your syntheses efficient (i.e. the target should be produced in the highest possible yield). More than one step will be required. Please show all the intermediate products in your synthesis (not intermediates in the mechanisms, but actual isolated molecules on the path from starting material to product). That is, please do not put multiple reactions over one arrow. (Continued on next page)

a)



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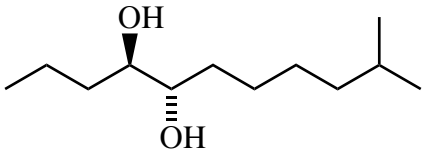
5) – Continued –

b)



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