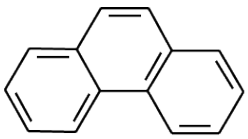
CH 630
Midterm Exam 1
Friday, October 31, 2008

Please write answers in the blue books provided; you may keep the exam paper unless there is anything written on it you wish graded.

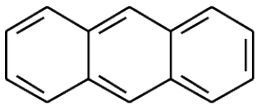
You may use numerical calculators, molecular models and/or drawing templates, but no notes, books or other materials containing chemical information.

1. (20 points) Quantitatively estimate the enthalpy difference between cis and trans-1-methyldecalin (1-methylbicyclo-[4.4.0]-decane). (Hint: begin by drawing 3-D structures of all conformers for each.)

2. (20 points) Use your understanding of bonding to explain why phenanthrene behaves more like an alkene when compared to its isomer anthracene.

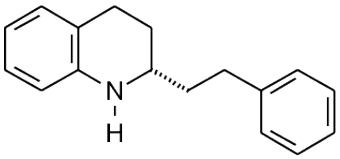


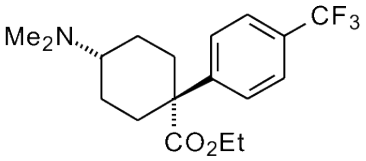
Phenanthrene

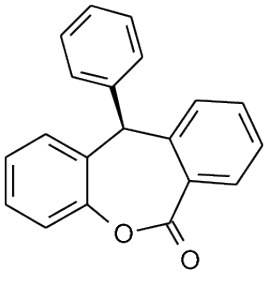


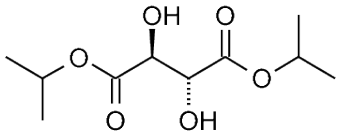
Anthracene

3. (24 points) Assign all stereogenic centers (R or S) in each molecule, and indicate whether the molecule is chiral or achiral.

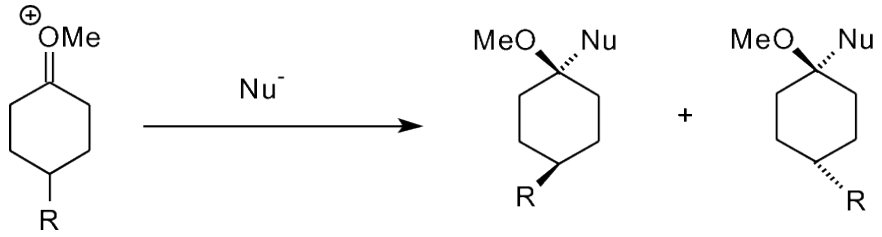








4. (36 points) Consider the reaction of nucleophiles with the following stabilized carbocation (generated under SN1 conditions):



A. Draw the two dominant conformers of the carbocation, and indicate which is the more stable for R=CH_2CH_2Ph.

B. Draw the two dominant conformers of the carbocation, and indicate which is the more stable for R=OCH_2Ph.

C. Draw the conformations of the possible products for R=CH_2CH_2Ph and Nu = CH_2=CH-CH_2^-.

D. Draw the conformations of the possible products for R=OCH_2Ph and Nu = CH_2=CH-CH_2^-.

E. Choose one of either case in (C, D), and draw potential energy diagrams for the possible reaction outcomes.

F. The experimental outcome is shown below. Explain whether the Curtin Hammett principle applies to the case you chose to illustrate. If more information is needed, specify what additional thing(s) you would need to know in order to reach a conclusion.

R	Cis	Trans
CH_2CH_2Ph	5%	95%
OCH_2Ph	80%	20%