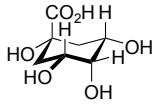
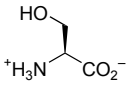
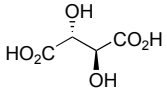
Due in class: Tuesday, Feb. 20, 2007 at 12:05 pm.

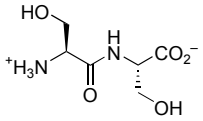
Monday 2.12.2007

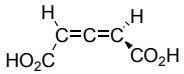
1. For each molecule:
- **Indicate whether or not it is chiral or achiral at 25 °C.**
- **Assign absolute configuration to all stereocenters using the Cahn-Ingold-Prelog convention.**
- **For achiral molecules, describe the symmetry element.**

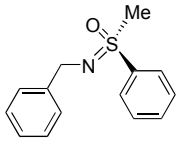
a. 

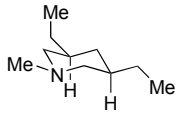
b. 

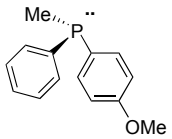
c. 

d. 

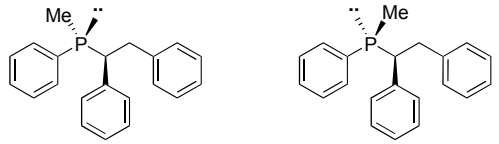
e. 

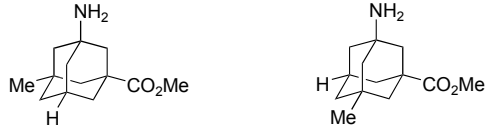
f. 

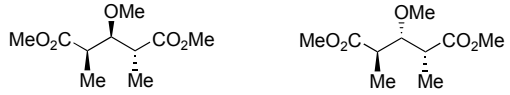
g. 

h. 

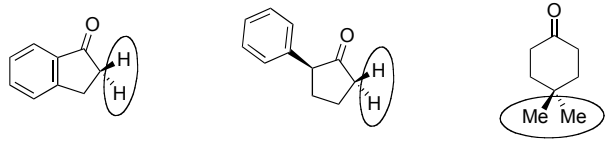
2. For each pair of compounds:
- **Specify the isomeric relationship (i.e., identical, constitutional isomers, diastereomers, or enantiomers).**
- **Assign absolute configuration to all stereocenters using the Cahn-Ingold-Prelog convention.**

a. 

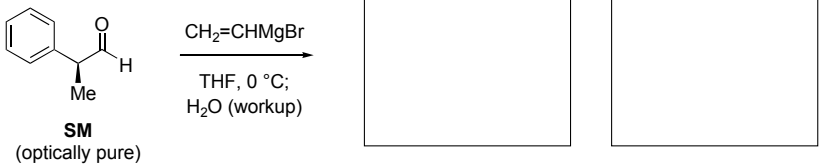
b. 

c. 

3. For each of the circled groups indicate their topological relationship.



4. Consider the following reaction:



SM
(optically pure)

P-I **P-II**

a) Provide the structure of the two principal addition products, clearly indicating stereochemistry, and assign the Cahn-Ingold-Prelog configuration to each stereocenter of the SM and products.

b) Indicate whether each product is a chiral or an achiral compound.

P-I — Chiral — Achiral

P-II — Chiral — Achiral

c) What is the isomeric relationship between the two products (i.e. constitutional isomers, enantiomers, or diastereomers).

d) Do you expect the products to be formed in equal (1:1) or unequal amounts.

e) Draw a reaction coordinate diagram that is consistent with your answer in part 4d, clearly labeling the position of P-I, P-II, SM, and transition state structure(s).

5. Consider the following data:

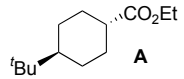
	1	**2**	**3**	**4**
$\Delta G^{\ddagger}$ for inversion (kcal/mol)	7.0	20.5	17.1	11.7

a) Explain why the activation energy for inversion of **2** is greater than that for **1**. Provide an energy diagram.

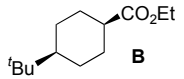
b) Why is the activation energy for inversion of **3** less than that for **2**. Provide an energy diagram.

c) Why is the activation energy for inversion of **4** less than that for **2**. Provide an energy diagram.

6. Consider the following two esters:



A



B

Ester **A** is observed to undergo base catalyzed hydrolysis 20 times faster than ester **B**. Provide an explanation for this result and support your answer using clear and detailed drawings.