

Seat No. \_\_\_\_\_

Name \_\_\_\_\_  
(Please print your name and **circle** your last name)

**CHEMISTRY 331**

**EXAM III**

Wednesday, April 2, 2008

- I. (18 points) \_\_\_\_\_
- II. ( 5 points) \_\_\_\_\_
- III. (12 points) \_\_\_\_\_
- IV. ( 8 points) \_\_\_\_\_
- V. ( 8 points) \_\_\_\_\_
- VI. (16 points) \_\_\_\_\_
- VII. (10 points) \_\_\_\_\_
- VIII. (15 points) \_\_\_\_\_
- IX. ( 8 points) \_\_\_\_\_

\_\_\_\_\_

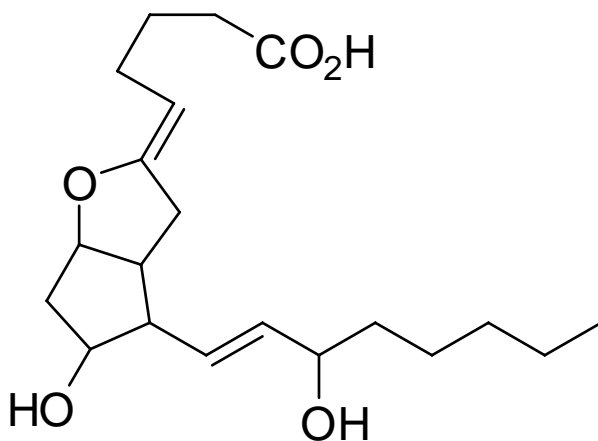
TOTAL(100 points) \_\_\_\_\_

I. (18 pts.) For the following questions MATCH each definition to a term from the list below. Place the letter of the term in the blank provided.

- |                     |                        |
|---------------------|------------------------|
| a) racemates        | f) meso compounds      |
| b) chirality center | g) optically active    |
| c) chirality        | h) prochirality center |
| d) diastereomers    | i) optically inactive  |
| e) enantiomers      | j) achiral             |

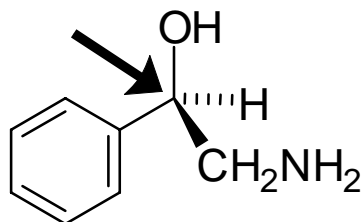
- \_\_\_\_\_ describes an organic molecule which rotates plane polarized light
- \_\_\_\_\_ is the property of “handedness”, the property that causes an object to be nonsuperimposable on its mirror image.
- \_\_\_\_\_ are stereoisomers that are not mirror images.
- \_\_\_\_\_ is an atom in a molecule that is bonded to four different atoms or groups of atoms.
- \_\_\_\_\_ are molecules which contain chirality centers and a plane of symmetry.
- \_\_\_\_\_ describes an  $sp^3$ -hybridized atom that can become a chirality center by changing one of its attached groups.

II. (5 pts.) Place asterisks (\*) at all of the chirality centers in this molecule.

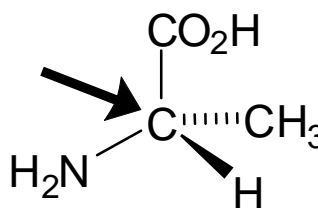


- III. (12 pts.) The alkane formed by hydrogenation of (s)-4-methyl-1-hexene is optically active while the one formed by hydrogenation of (s)-3-methyl-1-pentene is not. Draw the two starting alkenes and the two products of hydrogenation using wedge/dotted line structures and explain in one sentence or less why one product is optically active and one is not.

- IV. (8 pts.) Assign configurations for the carbon atoms indicated by arrows.



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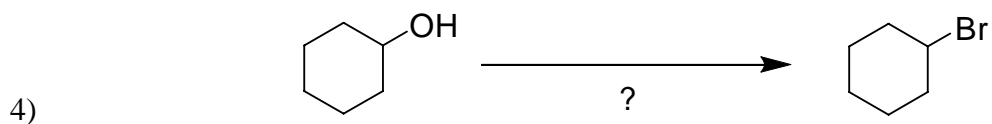
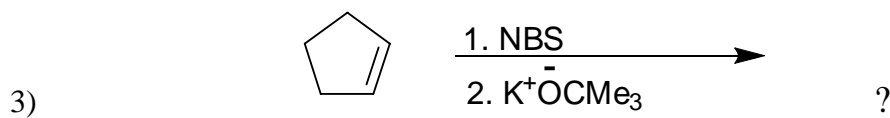
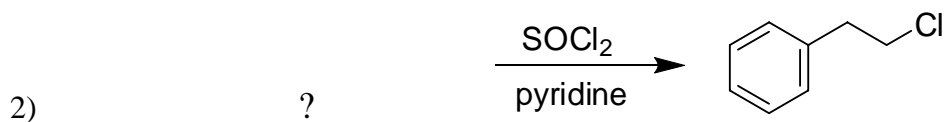
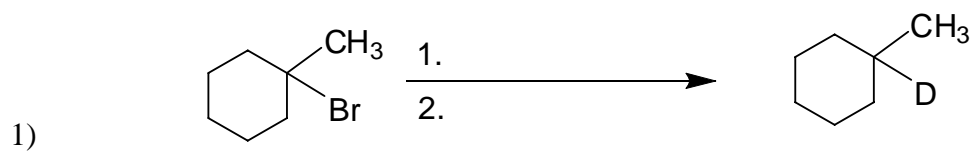
( )—

V. (8 pts.) Provide stereochemically correct structures for:

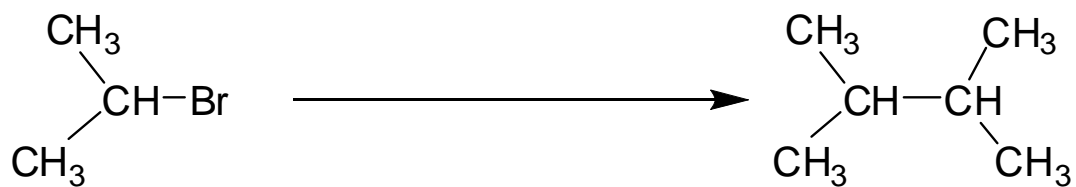
1) trans-1-chloro-3-sec-butylcyclohexane

2) (s)-3-bromo-1-butene

VI. (16 pts.) Provide the missing element (starting material, reagents, intermediates or products) for the following equations.

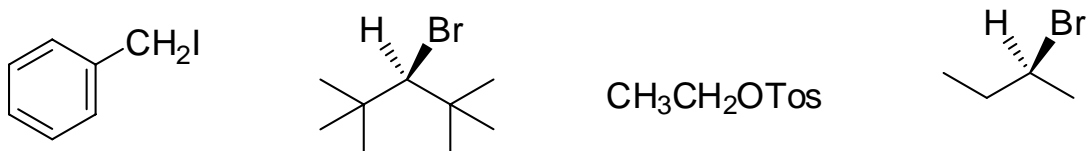


VII. (10 pts.) Using isopropyl bromide as your only source of carbon, and assuming the availability of any necessary reagents, how would you perform the following transformation?

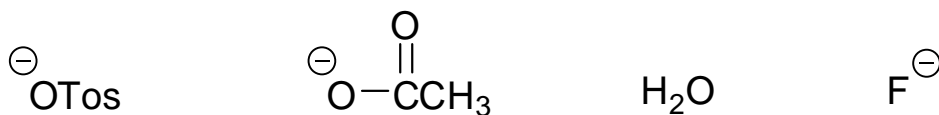


VIII. (15 pts.) Circle your response in each of the following sets.

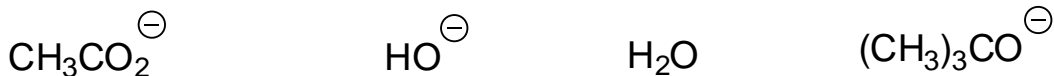
A. The least reactive compound in an SN2 reaction.



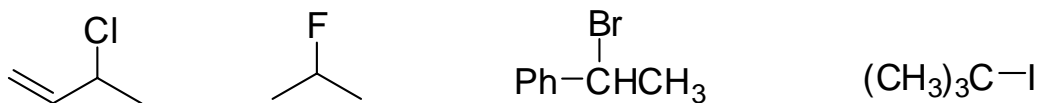
B. The best leaving group in an elimination rxn.



C. The best nucleophile in a substitution rxn. at a 1° carbon.



D. The least reactive compound in an SN1 reaction.

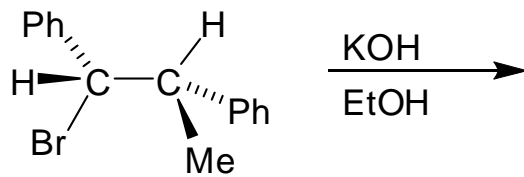


E. The best solvent for an SN2 reaction



IX. (8 pts.)

A) Complete the following E<sub>2</sub> elimination with the expected product.



B) Draw the Newman projection of the conformation of the starting material from which the reaction occurs.