

## Chemistry 3A

### Midterm #2

Student name: \_\_\_\_\_

Student signature: \_\_\_\_\_

TA's name or section number: \_\_\_\_\_

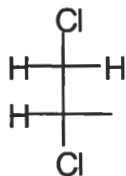
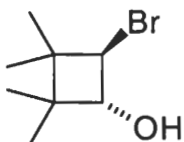
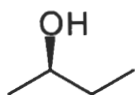
Problem 1	_____	(30 pts)
Problem 2	_____	(36 pts)
Problem 3	_____	(14 pts)
Problem 4	_____	(48 pts)
Problem 5	_____	(45 pts)
Problem 6	_____	(27 pts)
<b>Total Points</b>	_____	<b>(200 pts)</b>

**No Calculators Allowed**  
**Be Sure Your Exam has 10 Pages**  
**Be Sure To Try All Parts of Each Problem!**

Acid	pKa	Acid	pKa
HI	-5.2	CH <sub>3</sub> CO <sub>2</sub> H	4.7
H <sub>2</sub> SO <sub>4</sub>	-5.0	HCN	9.2
HBr	-4.7	CH <sub>3</sub> SH	10.0
HCl	-2.2	CH <sub>3</sub> OH	15.5
H <sub>3</sub> O <sup>+</sup>	-1.7	H <sub>2</sub> O	15.7
CH <sub>3</sub> SO <sub>3</sub> H	-1.2	NH <sub>3</sub>	35
HF	3.2		

## Organic Lingo

1A. Provide a systematic name for the following compounds. Use common nomenclature for any branched substituents. (30 pts)

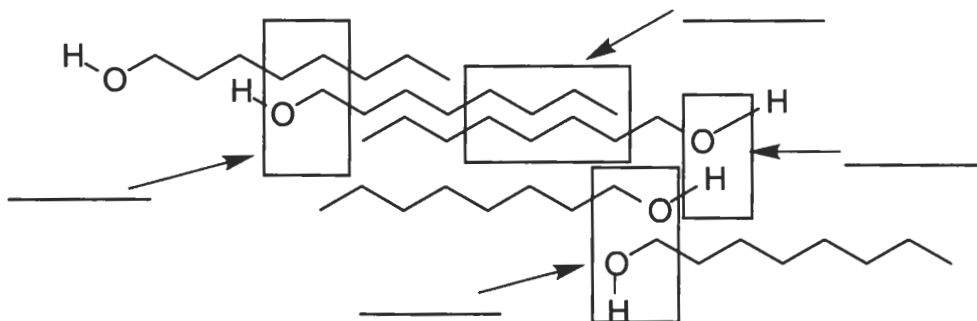


B. Draw a structure for the following names. For cycloalkanes use flat rings. For all others use bond-line notation.

- (S)-4-chloro-2,2-dimethyl-1-hexanol

- (1R,4S)-4-ethyl-1-fluoro-1-iodo-3,3-diisopropylcyclohexane

C. Van der Waals forces are made up of Induced Dipole Induced Dipole (IDID), Dipole Induced Dipole (DID) and Dipole Dipole (DD) interactions. On the diagram below indicate which one of these best represents the interaction taking place in each box.



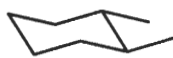
## Mirror, Mirror on the Wall

2. (36 pts)

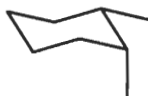
For each pair of molecules use one term (and only one) that best describes their relationship to one another. Minus one point for every wrong answer.

The terms to choose from are: (you may use the abbreviations shown)

Identical (I)    enantiomers (E)    diastereomers (D)    none of these (N)



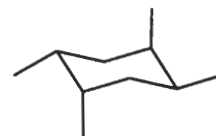
A



B



C



D

A and B: \_\_\_\_\_

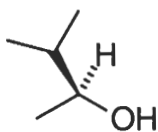
A and C: \_\_\_\_\_

A and D: \_\_\_\_\_

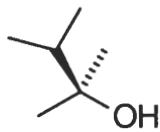
B and C: \_\_\_\_\_

B and D: \_\_\_\_\_

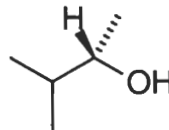
C and D: \_\_\_\_\_



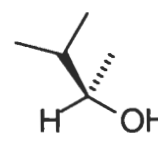
E



F



G



H

E and F: \_\_\_\_\_

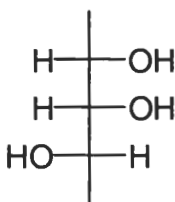
E and G: \_\_\_\_\_

E and H: \_\_\_\_\_

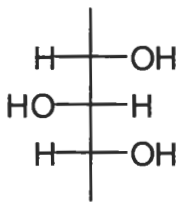
F and G: \_\_\_\_\_

F and H: \_\_\_\_\_

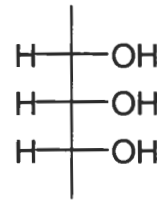
G and H: \_\_\_\_\_



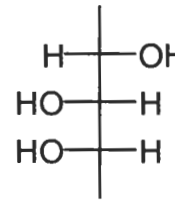
I



J



K



L

I and J: \_\_\_\_\_

I and K: \_\_\_\_\_

I and L: \_\_\_\_\_

J and K: \_\_\_\_\_

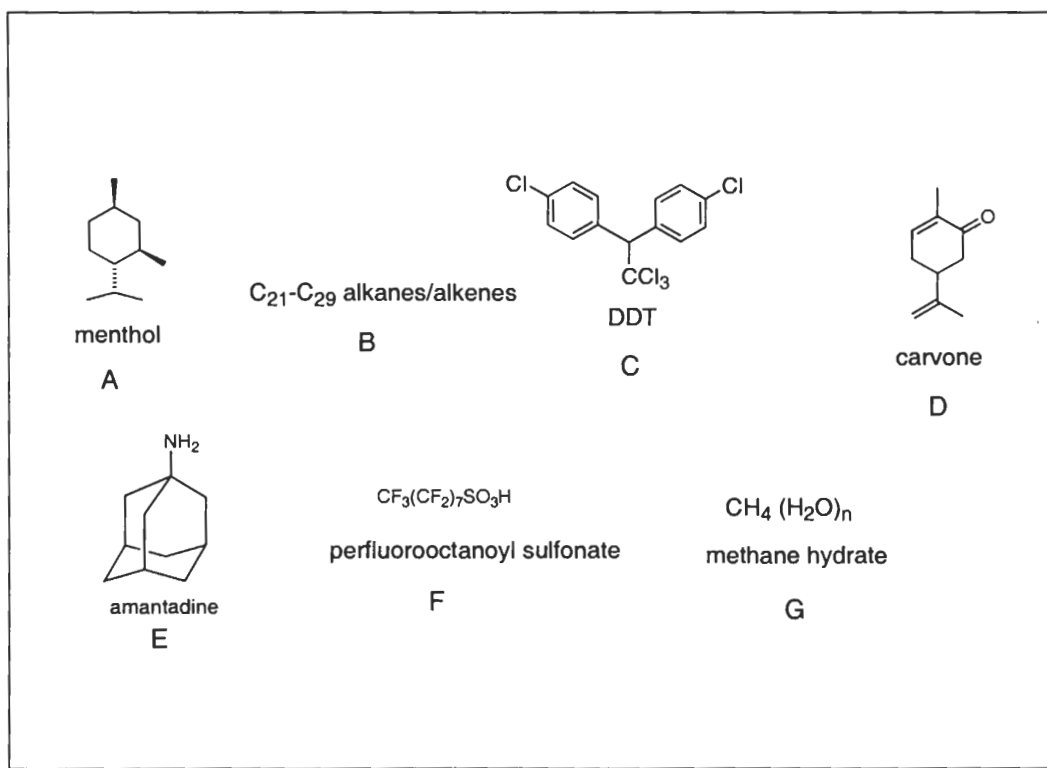
J and L: \_\_\_\_\_

K and L: \_\_\_\_\_

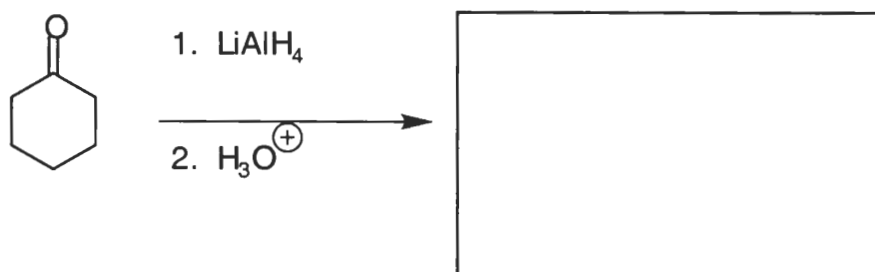
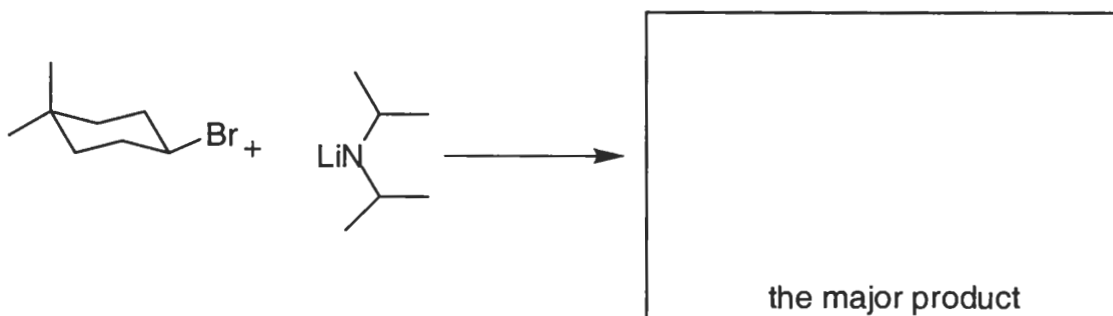
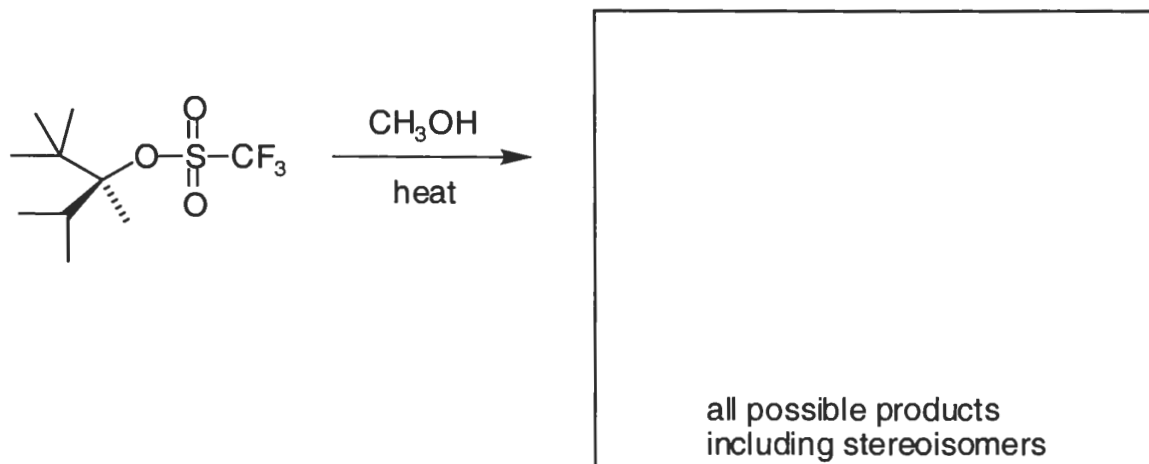
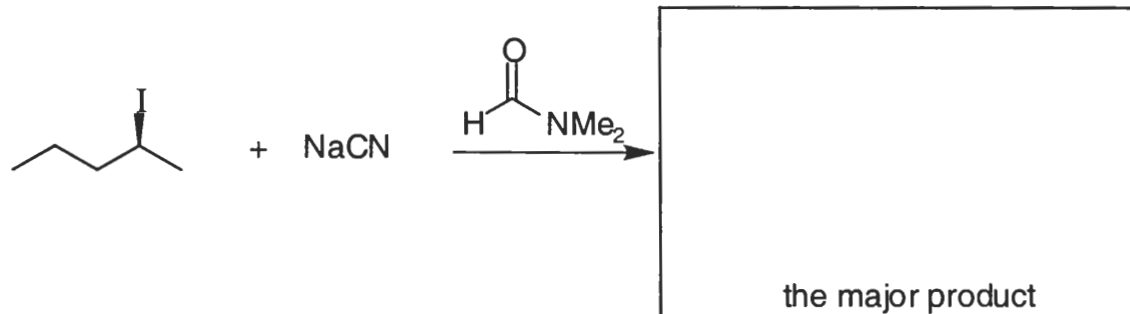
### Molecule of the Day

3. Match the molecules shown below with the statements. (14 pts)

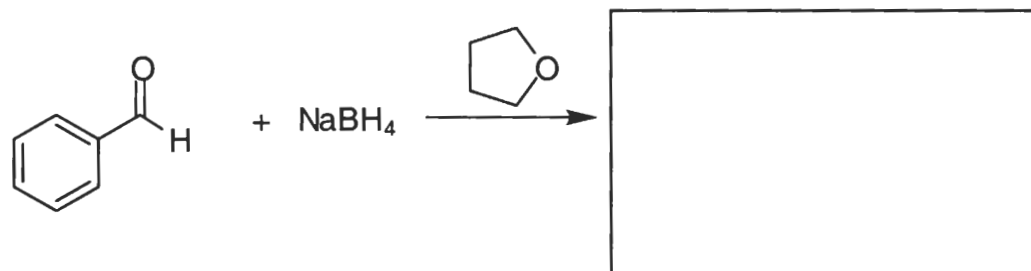
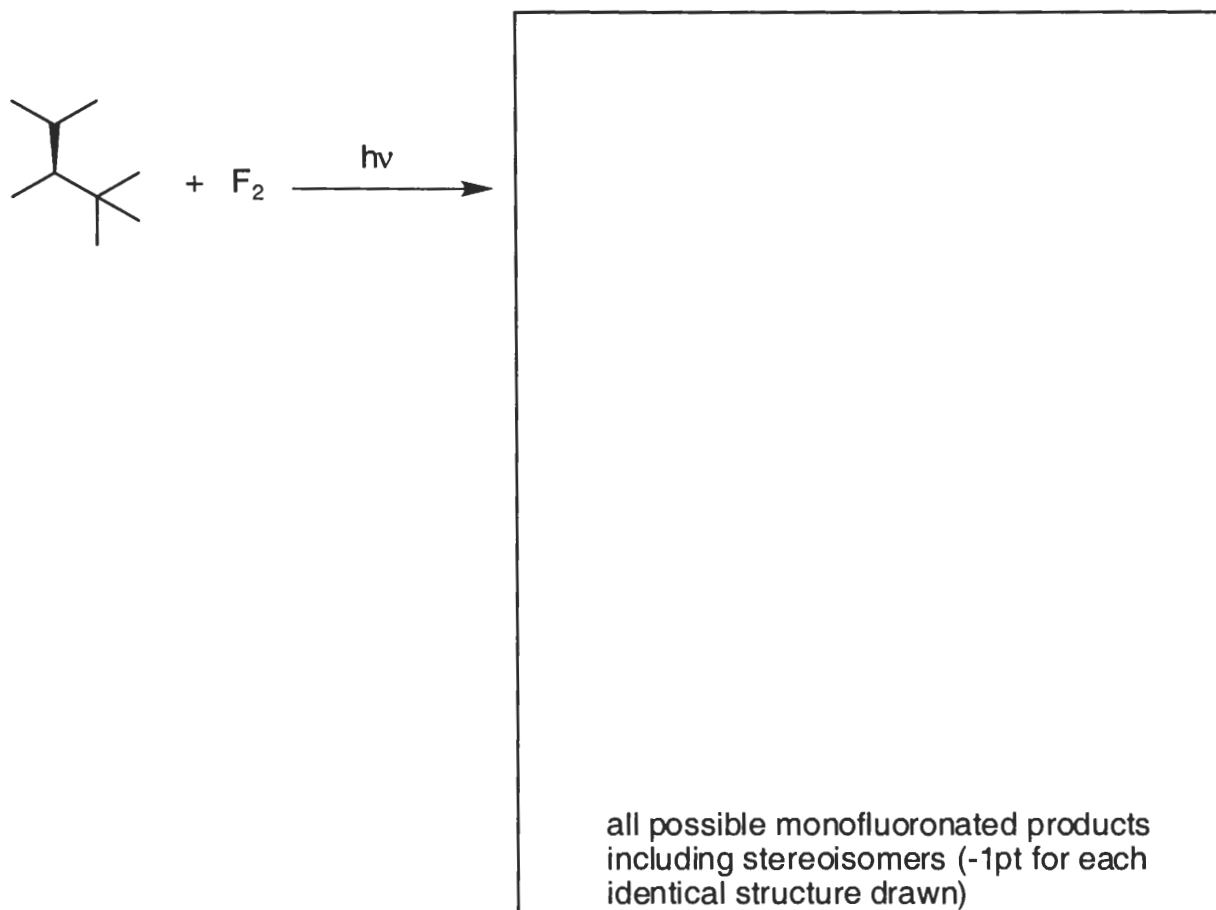
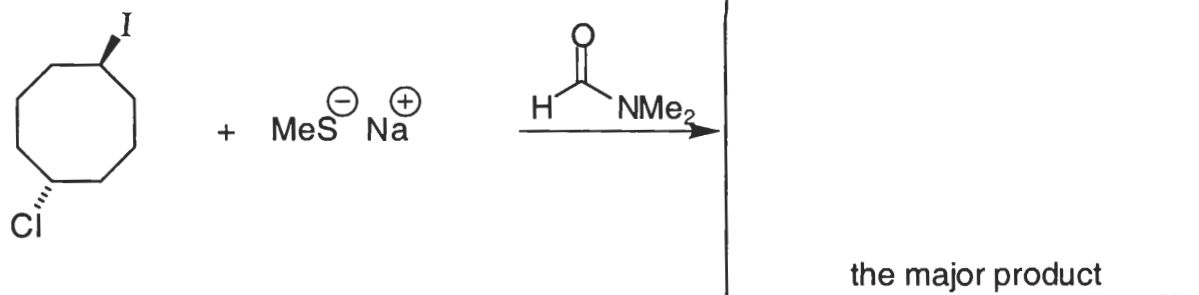
- A greasy antiviral. \_\_\_\_\_
- Scotchgard in the arctic! \_\_\_\_\_
- Flaming ice cubes. \_\_\_\_\_
- Spearmint or caraway. Let your chiral nose tell the difference. \_\_\_\_\_
- O. Sphegodus wears a tantalizing perfume. It is called BEEWARE. \_\_\_\_\_
- A little bit of a Jeckel and Hyde molecule. It helps save humans and helps destroy birds. \_\_\_\_\_
- Get some of this molecule on you and you are in for a chilling experience. \_\_\_\_\_



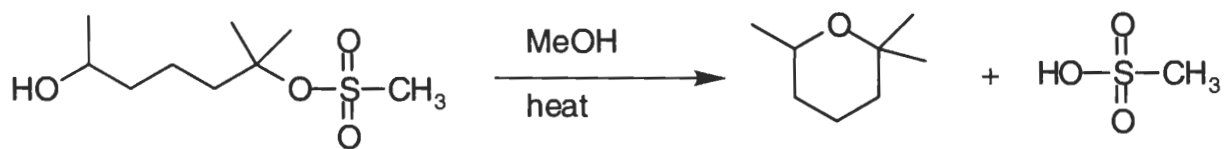
4. Predict the product(s) from the following reactions. Pay attention to any instructions given in the boxes. (48 pts)



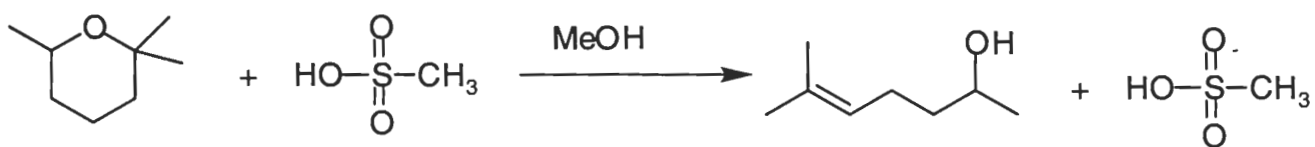
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5. Write logical arrow-pushing mechanisms for the following reactions. (45 pts)



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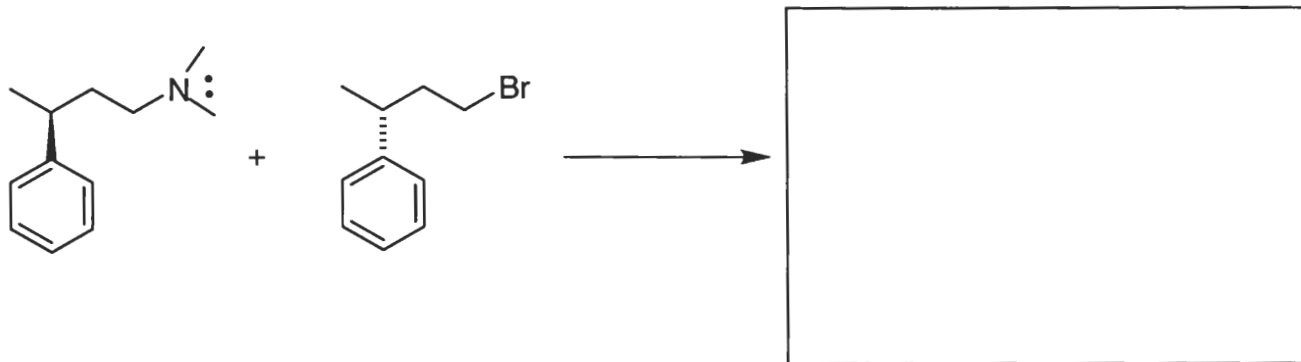
YOU WILL NOT NEED ALL THIS SPACE. I JUST DIDN'T WANT TO START THE NEXT PROBLEM ON THIS PAGE.



### Above and Beyond?

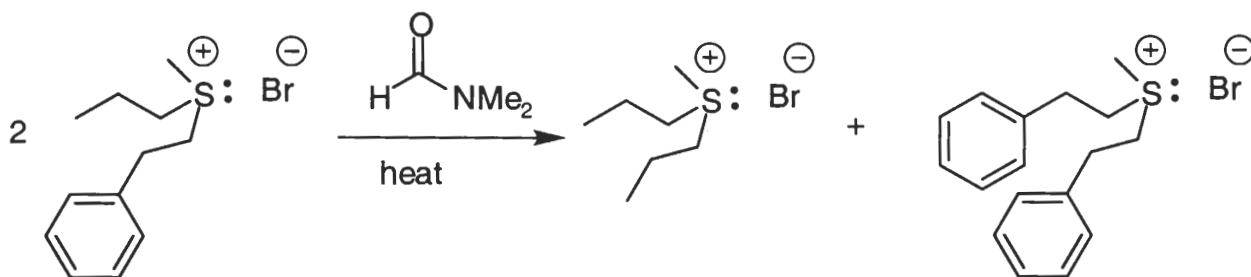
6. 27 pts

- A. Reaction of the following two optically pure compounds led to a SINGLE product that was OPTICALLY INACTIVE. Show the product and EXPLAIN WHY it is optically inactive.



- B. Starting with any ACHIRAL substituted cyclohexane of your choice design an experiment that would allow you to determine if the  $S_N2$  reaction goes with inversion or retention of configuration. Be sure to show all of your starting materials. Also show and label the products you would expect to obtain if the reaction went with inversion or retention of stereochemistry.

- C. Write logical arrow-pushing mechanisms that account for formation of the following products. NOTE: The two products shown are not the only ones formed in this reaction. However, they are the only ones you have to account for in your mechanism.



*“One of life’s quiet excitements is to stand somewhat apart from yourself and watch yourself softly becoming the author of something beautiful, even if it is only a floating ash.”*

*Norman Maclean, A River Runs Through It*