**Department of Chemistry and Biochemistry**

**Chemistry 59-230/232** **Midterm #2**
**Time: 50 min.** **Nov. 19, 2004**

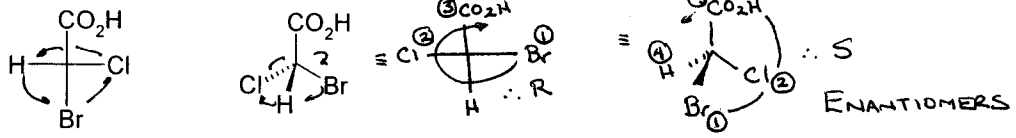
**NAME** _____ **ID#**_____

**COURSE SECTION (01 for Tues/Thurs, 02 for Mon/Wed/Fri)** _____

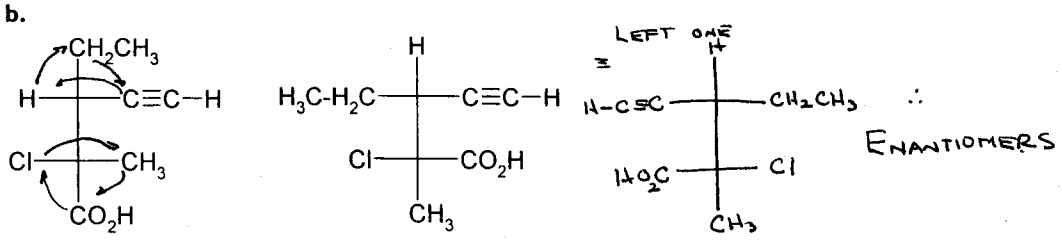
*Note: **Please answer on the test paper.** There is an extra sheet for rough work at the back, but it will not be marked unless asked. Tests written in pencil will be marked, but cannot be returned for remarking.*

**1.** Identify the relationship between each of the following pairs (i.e., enantiomers, diastereomers, identical, structural isomers). Are any of the compounds meso forms? If so, indicate which one(s). (total 10 marks)

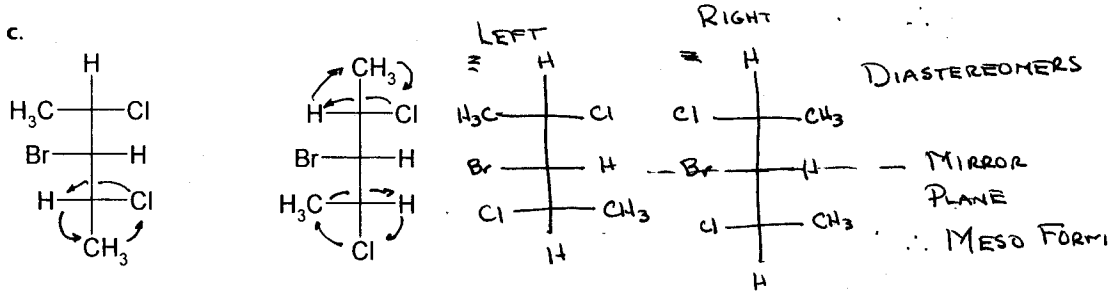
**a.**




**b.**

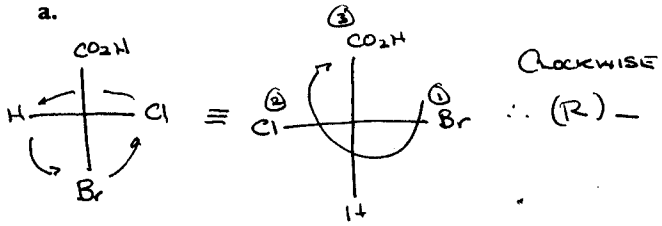



**c.**

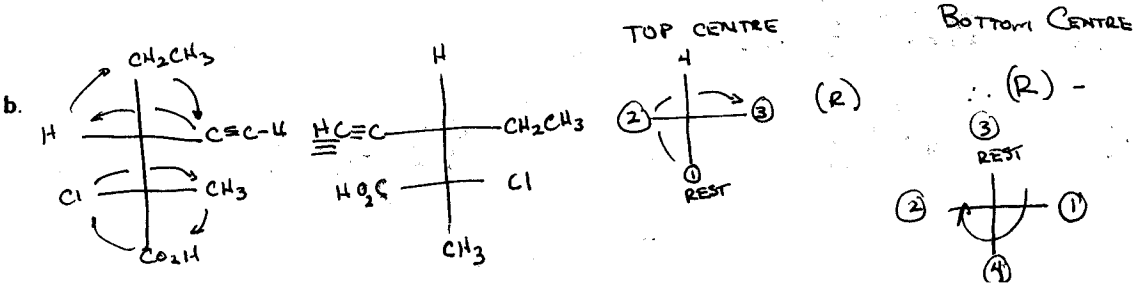



**2.** For the structures on the **left** side **1a** and **1b** only, identify each chiral centre as (R)- or (S)-. Show how you arrived at your answer (5 marks each, total 15)

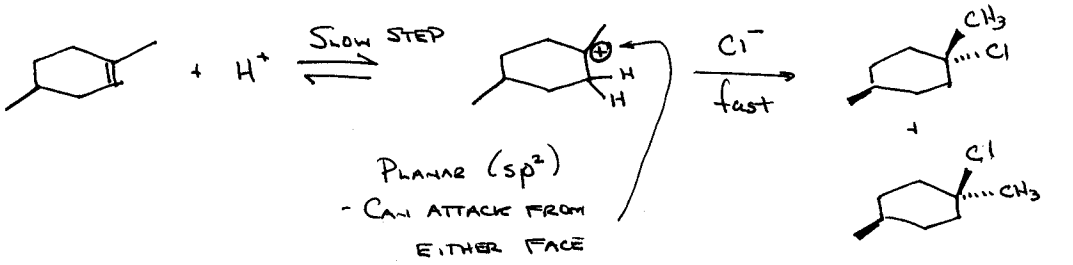
**a.**




**b.**



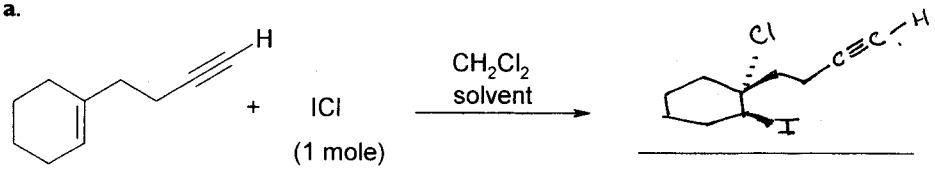
3. Draw the complete mechanism of the addition HCl to 1,4-dimethylcyclohexene. Indicate which is th slow step. Show any stereochemistry if it is important.(15 marks)




YOU COULD ALSO DRAW THE ENANTIOMERS, BUT IT IS NOT NECESSARY.

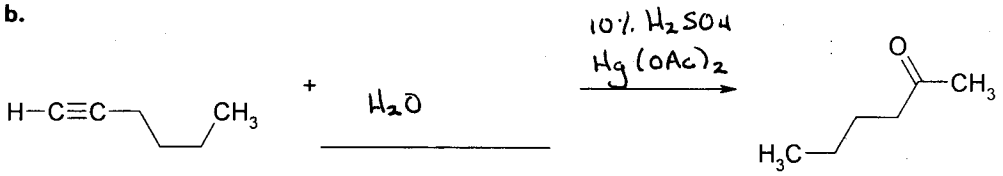
4. For each of the following reactions, fill in the blank with the structural formula of the requir chemical. Show any required catalysts over the reaction arrow. Be sure to include stereochemistry where it important. Note: There *may* be more than one reagent or more than one step required per blank. (Total ? marks)

a.

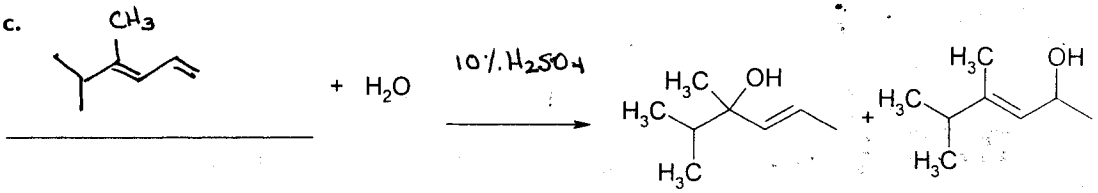



1 mole

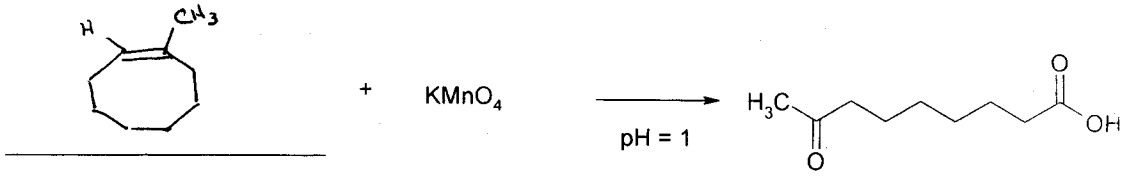
b.



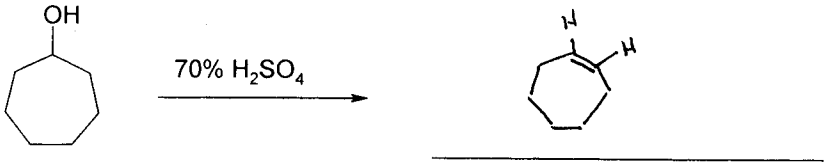

c.




d.

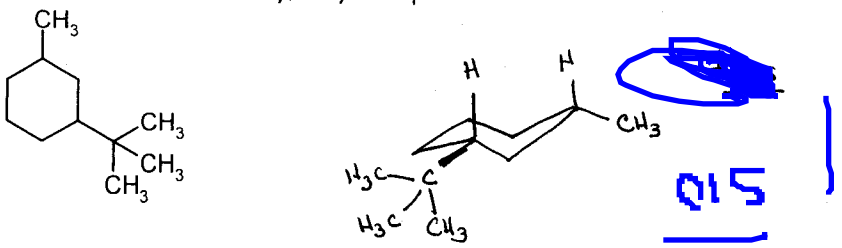



e.

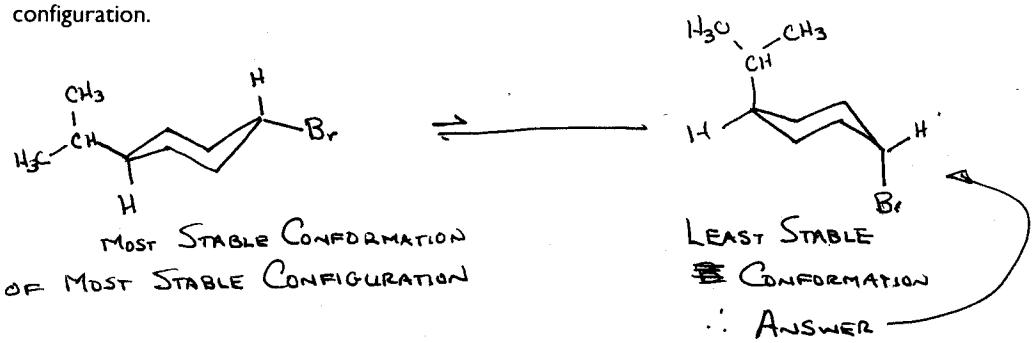



**5.** (10 marks) For a ranking in terms of size, $C(CH_3)_3 > CH(CH_3)_2 > CH_2CH_3 > CH_3 > NH_2 > OH > F, Cl, Br > I > H$

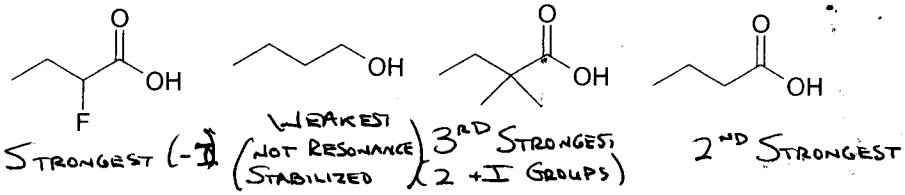
a) Draw the following compound in its most stable configuration *and* conformation. I have intentionally omitted the stereochemistry, for you to provide it.



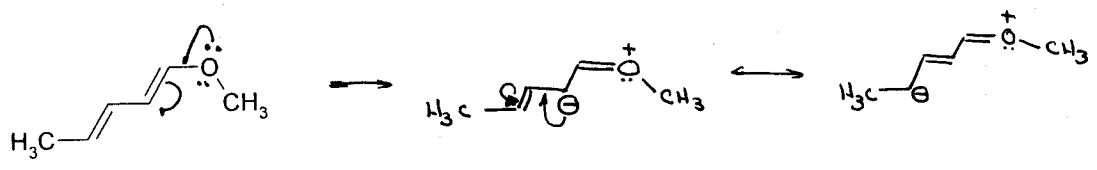

b) Draw 1-bromo-4-isopropylcyclohexane in the least stable chair conformation of its most stable configuration.

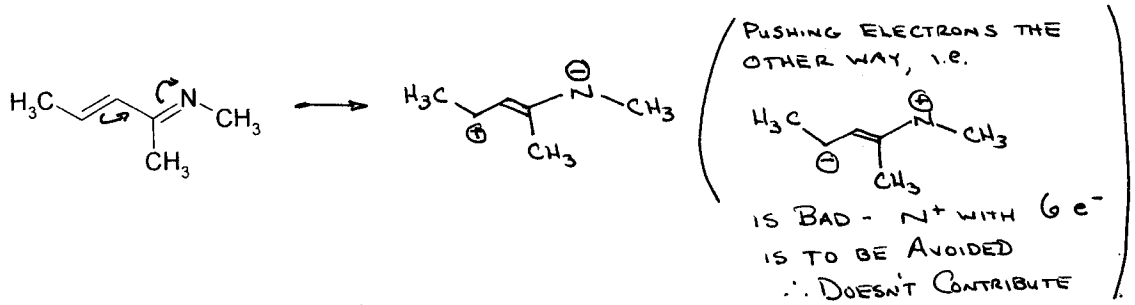



**6a)** Rank the following in terms of strength of acid, going from the strongest to weakest (4 marks)

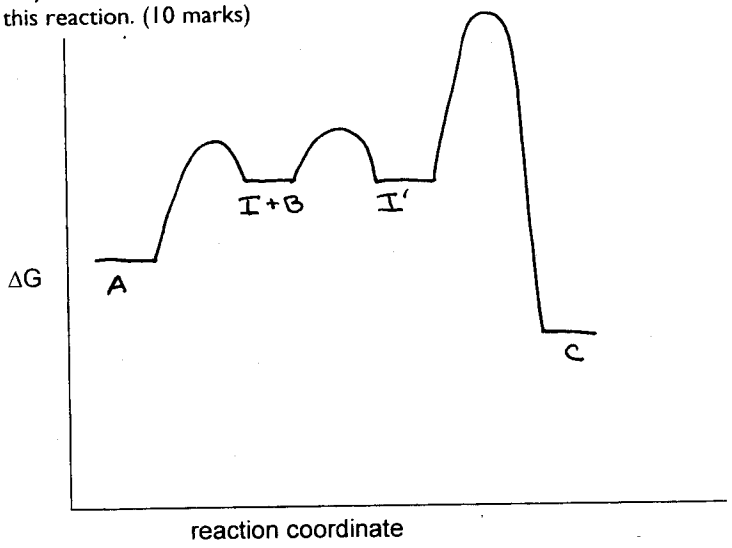



b) Draw all reasonable resonance forms for the following structures. For each of these, show the appropriate use of curved arrows demonstrating the electron movement leading to the other resonance forms (11 marks

i. 

ii. 


**7.** Draw the energy profile in which A and B are converted into C in three steps, where B is involved only in the second step, and where the final step has the highest activation energy. Draw the rate equation for this reaction. (10 marks)




rate (v) = $k$ [A][B]

= $k'$ [I][B] IS ALSO FINE

**Bonus.** If a silicon atom is present in the allylic position of an alkene, electrophiles don't add to the alkene but ultimately do a *substitution*. Based on analogy with what you've seen in the course, propose a reasonable mechanism for the substitution. (Up to 5 additional marks)