

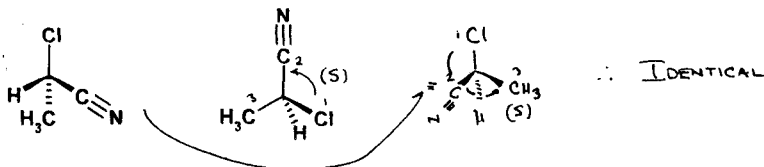
NAME _____ ID# _____

LAB SECTION (and TA) _____

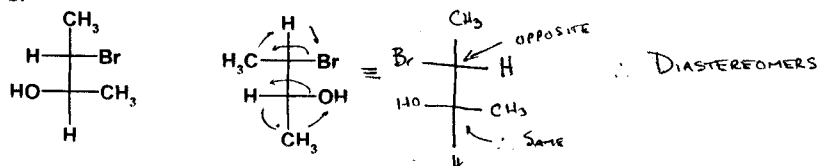
Note: Please answer on the test paper. There is an extra sheet for rough work at the back, but it will not be marked unless asked. Tests written in pencil will be marked, but cannot be returned for remarking.

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 16 marks)

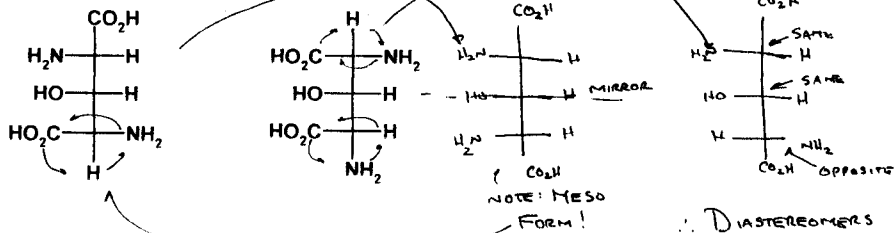
a.



b.



c.



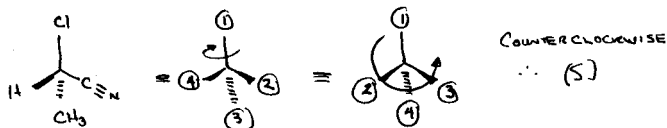
- d. Assuming the substituents (NH_2 , CH_3 , CO_2H , etc.) on the drawn centres have appropriate conformation, could any of the above compounds be drawn in their overall most stable conformation? If so, indicate which one(s).

YES! 1a, BOTH COMPOUNDS (WHICH ARE IDENTICAL ANYWAY)

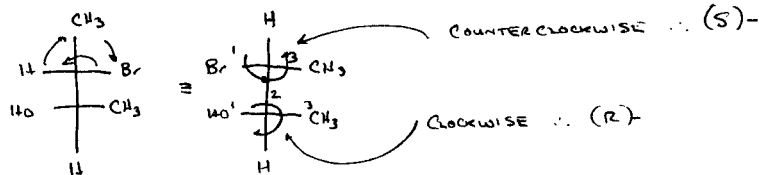
- b & c ARE FISCHER PROJECTIONS, WHICH ARE ECLIPSED.

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

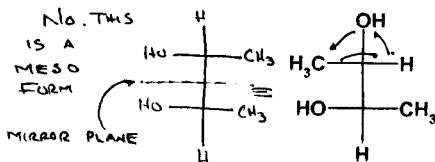
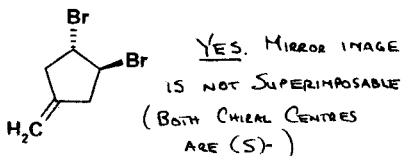
a.



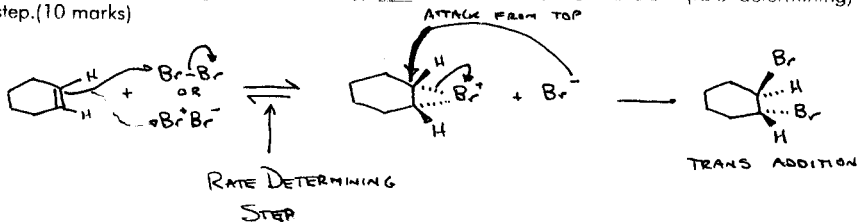
b.



- c) Do the following compounds rotate plane polarized light? I only need 'yes' or 'no'. (4 marks)

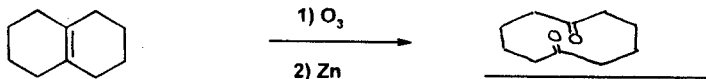


3. Draw the complete mechanism of the addition of bromine (Br_2) to cyclohexene. Show accurate intermediates, including stereochemistry, and indicate which is the slow (rate determining) step. (10 marks)

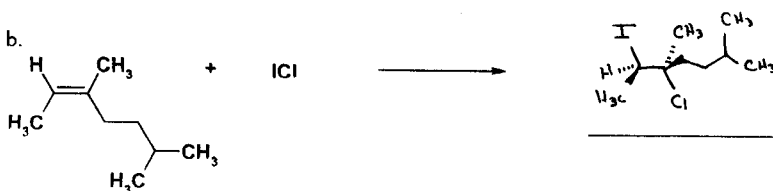


4. For each of the following reactions, fill in the blank with the structural formula of the required chemical. Show any required catalysts over the reaction arrow. Be sure to include stereochemistry where it is important. Note: There may be more than one reagent or more than one step required per blank. (Total 30 marks)

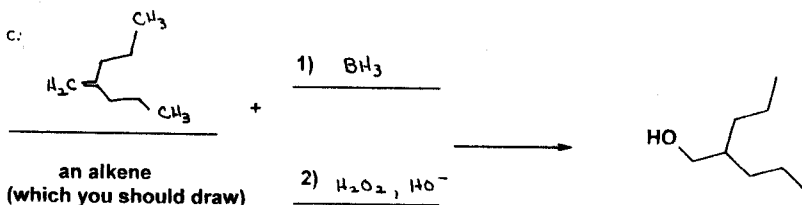
a.



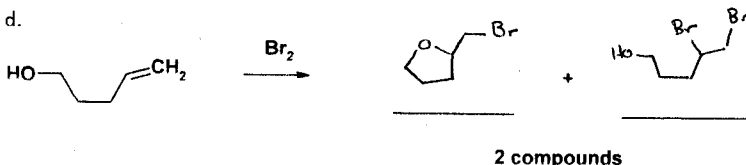
b.



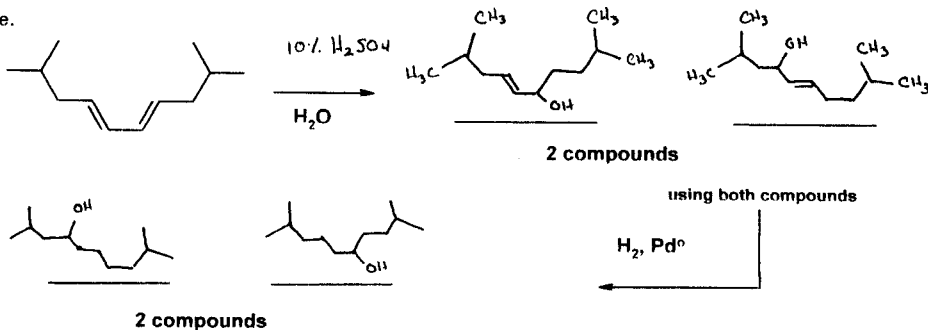
c.



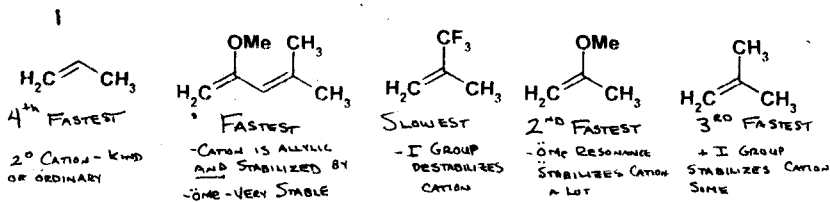
d.



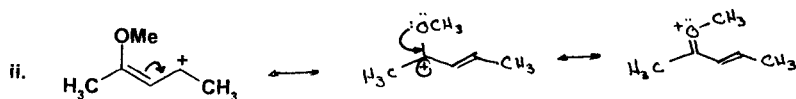
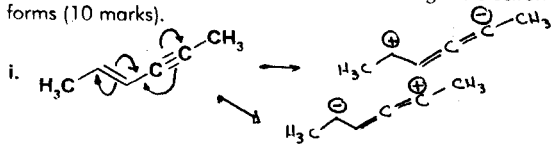
e.



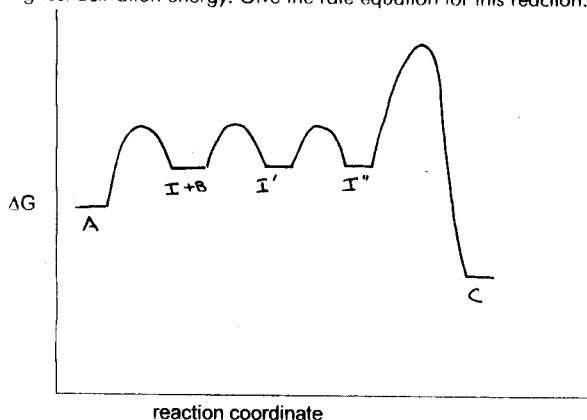
5a) Rank the following in terms of strength of rate of reaction with HCl, going from the fastest to slowest. Note: Me = CH₃ (5 marks)



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 (10 marks).

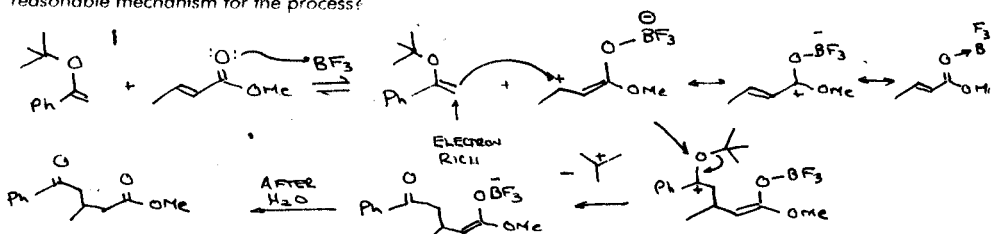


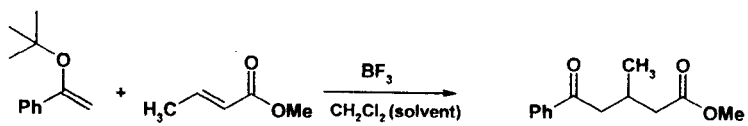
6. Draw the energy profile and indicate the intermediates for the reaction of A and B to give C in 4 steps. A is consumed in the first step, while B is consumed in the second step. The final step has the highest activation energy. Give the rate equation for this reaction. (10 marks)



$$\text{rate (v)} = k [A] [B] \quad \text{or} \quad = k' [I] [B]$$

Bonus. A reaction related to the reactions we've been studying is an important C-C bond forming reaction of alkenones or alkenoates called the Michael reaction. It can be caused to occur by Lewis acid in the presence of an enol ether. Below is an example of such a reaction; can you suggest a reasonable mechanism for the process?





Note: Me = CH_3