Department of Chemistry and Biochemistry

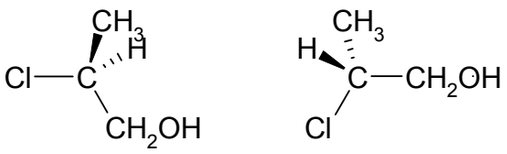
Chemistry 59-230/232 **Midterm #2**
Time: 50 min. **Nov. 13, 2003**

NAME _____ **ID#**_____

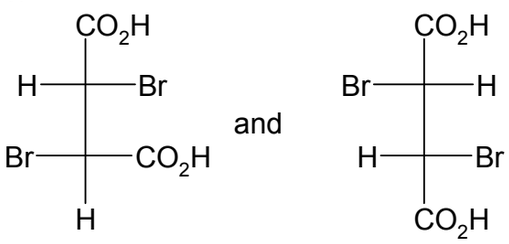
Note: ***Please answer on the test paper.*** *There is an extra sheet for rough work at the back, but it will not be marked unless asked. Tests written in pencil will be marked, but cannot be returned for remarking.*

1. Identify the relationship between each of the following pairs (i.e., enantiomers, diastereomers, identical). Are any of the compounds meso forms? If so, indicate which one(s). (total 14 marks)

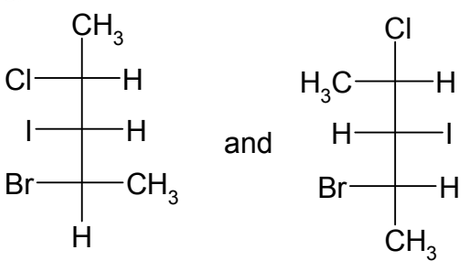
a.



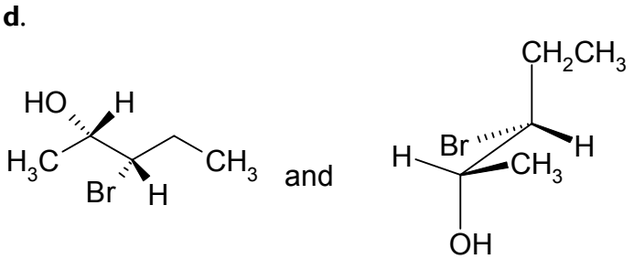
b.



c.



d.



2. For the structures on the **left** side **1a** and **1c** only, identify each chiral centre as (R)- or (S)-. Show how you arrived at your answer (4 marks each, total 16)

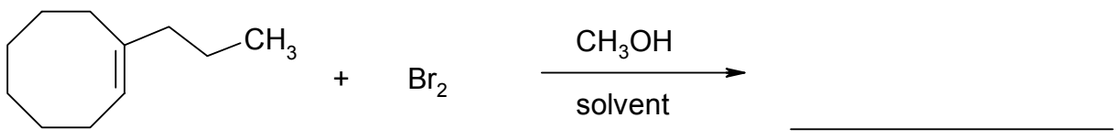
a.

b.

3. Draw the complete mechanism of the acid catalyzed electrophilic addition H_2O to 2-methyl-2-pentene. Indicate which is the slow step. Show any stereochemistry if it is important.(15 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 (except for **f**). Note: There *may* be more than one reagent or more than one step required per blank. (Total 30 marks)

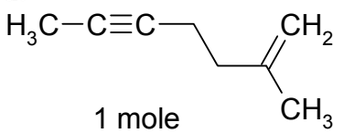
a.



b.

c.

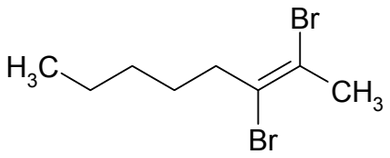
d.



+ HCl (1 mole) ⟶ _____

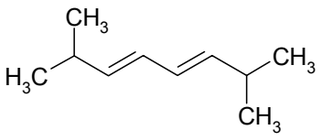
e.

_____ + Br_2 ⟶



Note for **e**: Yes, there is a reaction that does occur

f.

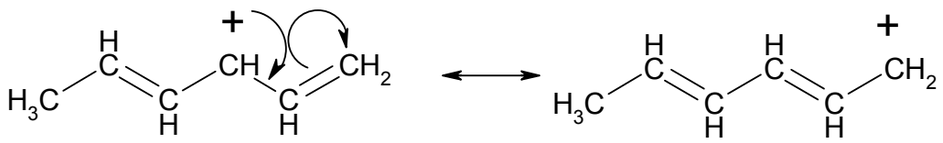


+ ICl ⟶ _____ + _____

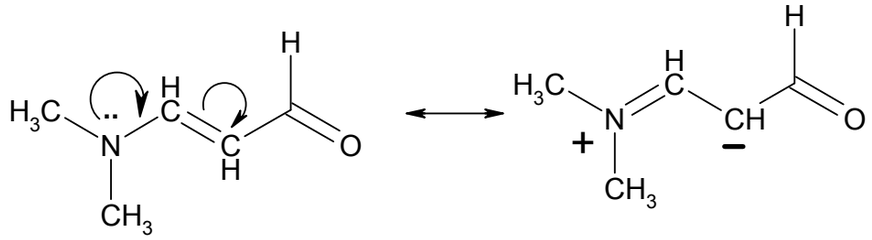
Note for **f**: Let's <u>not</u> worry about the stereochemistry in the **<u>2</u>** products here.

5. Which of the following examples illustrates the proper use of a curved arrow, and which do not? For any incorrect ones, show what the arrows would indicate the product to be. Also, indicate any additional reasonable resonance forms not displayed (additional curved arrows for these are *not* required, *but if* you draw any they must be correct). (15 marks total, including **c**)

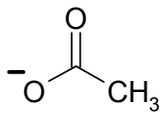
a.



b.

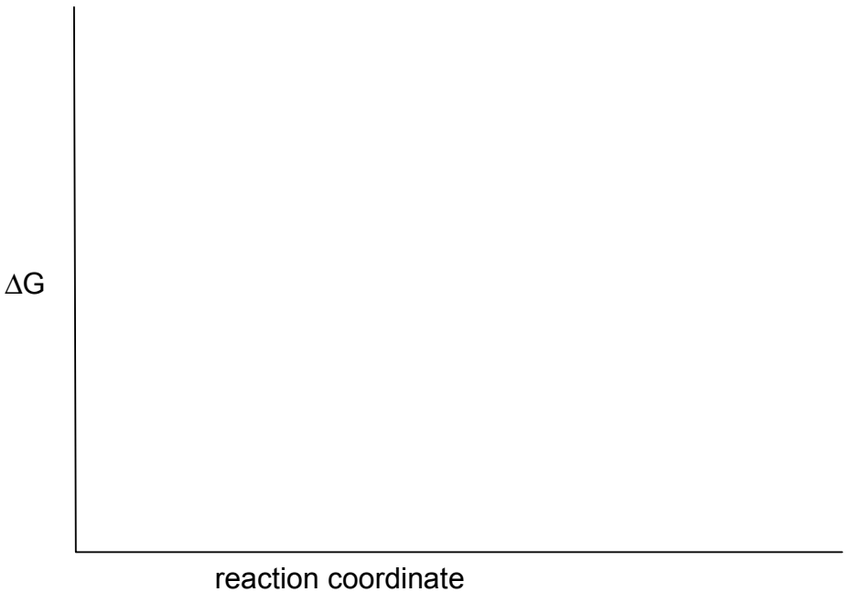


c. Rank the following in order of strength as base, going from strongest to weakest? (4 of the 15 marks)



, H_2O , $^{-}NH_2$, ^{-}OH

6. 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 first step has the highest activation energy. Draw the rate equation for this reaction. (10 marks)



rate (v) =

Bonus. The amino acids, which are the building blocks of all proteins, are organic molecules containing an amine functional group and a carboxylic acid functional group. Of the 20 *common* amino acids, 18 of them have (*S*)- configuration. Can you suggest which two that are the exceptions to this rule (Name and/or structure)? (Up to 6 additional marks)