Department of Chemistry and Biochemistry

Chemistry 59-230/232 **Midterm #1**
Time: 50 min. **Oct. 10, 2002**

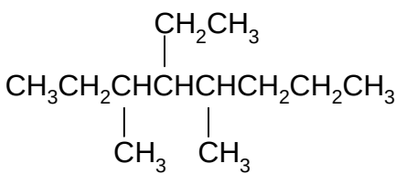
NAME _____ **ID#**_____

LAB SECTION (*enter 'no lab' if in 232 or not taking one)*_____

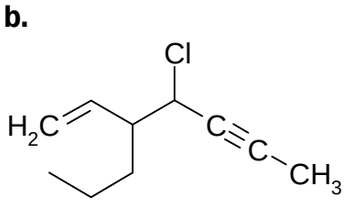
*Note: **Please answer on the test paper.** There is an extra sheet for rough work at the back, but it will not be marked. Tests written in pencil will be marked, but cannot be returned for remarking. For the 'promised' size ranking, see the intro to **5a**.*

1. Give correct IUPAC names for the following compounds. Include stereochemical descriptors where relevant. (5 marks each, total 20 marks)

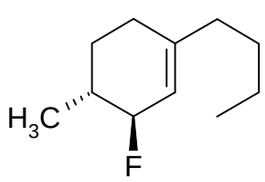
a



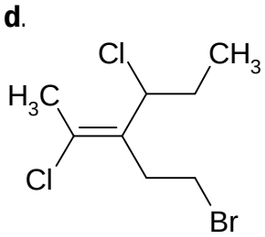
b.



c.



d.



2. Draw structures which correspond to the following given names. Drawings showing only carbons and other non-hydrogen atoms are acceptable. Please include the appropriate stereochemical aspects of the structure where it is needed. (5 marks each, total 15)

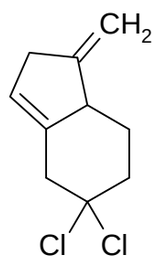
a. 1-isopropyl-3,3-dimethylcyclopentane

b. cyclobutylcyclohexane

c. *trans* 2-methyl-3-iodo-3-decen-5-yne

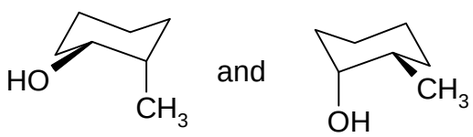
3. **a.** Draw all the possible structural isomers of C_6H_{14}. Identify the tertiary carbon atoms in any drawings where they appear. (8 marks)

b. What is the index of hydrogen deficiency of the following compound? (2 marks)



c. Apply the *Z* or *E* stereochemical descriptor where relevant in the above molecule. Show how you arrived at the distinction. (5 marks)

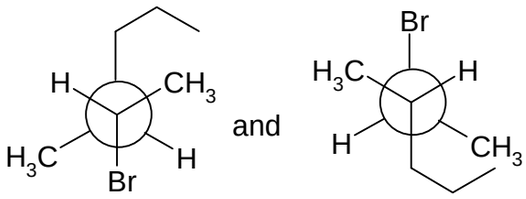
4. Assign the appropriate terminology (structural isomers, geometric isomers, configurational isomers, different conformations of the same molecule, identical) to the following. (Total 12 marks)
a. (6 of those 12 marks)



In addition for 'a', label for each of the non-hydrogen substituents axial/equatorial.

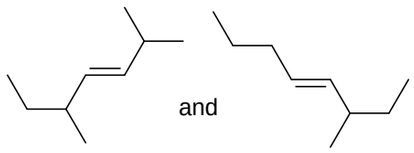
In (again) addition for 'a', which is the most stable structure? Why is this the case?

b. (4 of the 12 marks)

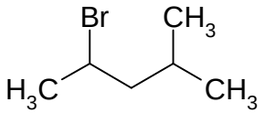


For 'b' what term describes the relationship between the bromine atoms and the propyl group?

c. (2 of the 12 marks)



5. **a.** Draw the possible Newman projections of the possible staggered conformations of the following compound, viewed down the C2-C3 bond. Rank them in terms highest to lowest stability. (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) (12 marks)



b. Draw the Newman projection of the **worst** possible conformation (from an energetic standpoint) of the above compound. (3 marks)

c. Draw *cis,cis*-1,3,5-trimethylcyclohexane in its least stable possible chair form. (5 marks)

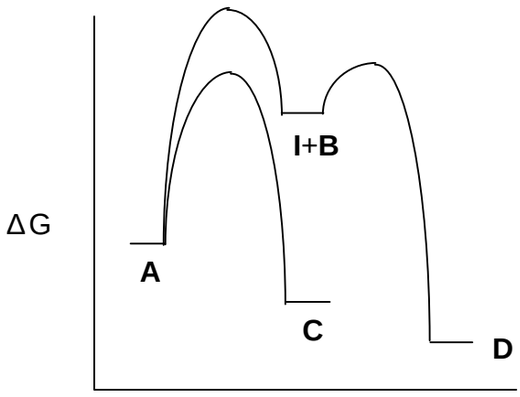
6. Consider the following reaction energy diagram, where **A** reacts to give **C** and can react with another species (**B**), to give **D**. The letter **I** stands for intermediate. (8 marks)

a) Which is the kinetic product of the reaction?

b) Which is the thermodynamic product?

c) What is the rate expression for the formation of **C**?

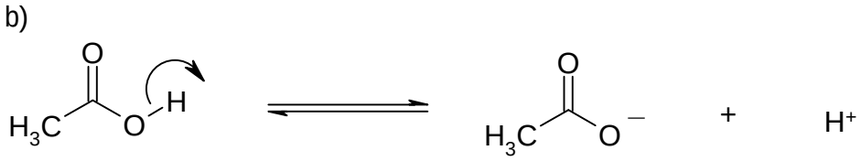
d) What is the rate expression for the formation of **D**?



7. Which of the following are proper uses of the curved arrow, and which are not? (5 marks). For any incorrect ones, show what the arrows would indicate the product to be (no matter how unstable it looks).

a)

b)



8. What is the hybridization of each of the carbon atoms in the following structure? (Yes, there is one tricky one, and no, it isn't a typo). (5 marks)

$H_2C{=}C{=}CH\text{-}CH_2\text{-}CH_3$