

Department of Chemistry and Biochemistry

Chemistry 59-230/232

Time: 50 min.

Midterm #1

Oct. 13, 2006

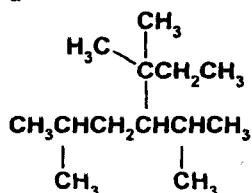
NAME _____ ID# _____

LAB SECTION – enter day/time/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. 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. (4 marks each, total 24 marks)

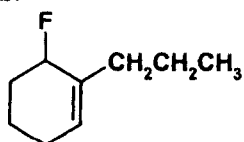
a.



2,5,5-TRIMETHYL-4-METHYLETHYL HEPTANE
OR

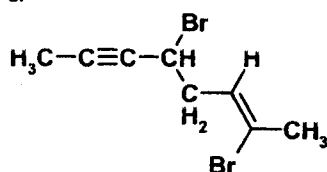
4-ISOPROPYL-2,5,5-TRIMETHYLHEPTANE

b.



6-FLUORO-1-PROPYLCYCLOHEXENE

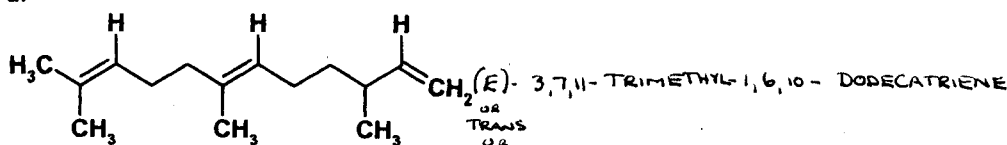
c.



(Z)- 2,5-DIBROMO OCT-2-EN-6-YNE
OR TRANS

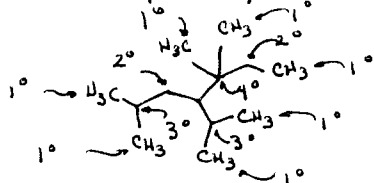
(Z)- 2,5-DIBROMO-2-OCTEN-6-YNE
OR TRANS

d.



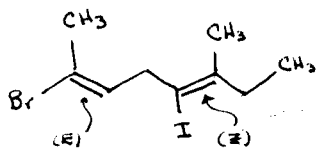
(E)- 3,7,11-TRIMETHYL-1,6,10- DODECATRIENE
OR TRANS

- e. Indicate for the structure in 1a which carbon atoms are primary, secondary, tertiary and quaternary.

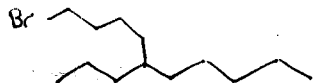


2. Draw structures which correspond to the following given names. Drawings showing only carbons and other non-hydrogen atoms are acceptable. Please include the appropriate stereochemical aspects of the structure where it is needed. One of these names is actually significantly wrong: indicate which one it is and write the correct name for the structure (we'll call that "d"). (4 marks each, total 16)

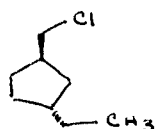
a. (2E,5Z)-2-bromo-5-iodo-6-methyl-2,5-octadiene



b. 4-(4-bromobutyl)nonane



c. *trans* 1-chloromethyl-3-ethylcyclopentane



d. 'b' IS WRONG, BECAUSE THE LONGEST CHAIN WAS NOT CHOSEN AS MAIN CHAIN
∴ SHOULD BE CALLED

1-BROMO-5-PROPYLDECANE

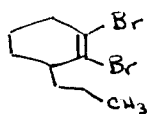
3. (Total 11 marks)

a. What is the index of hydrogen deficiency of $C_9H_{14}Br_2$. Draw one reasonable structure for such a compound. (4 marks)

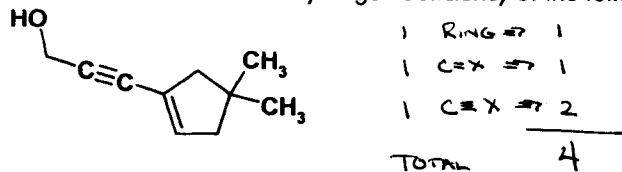
FOR IHD PURPOSES $C_9H_{14}Br_2 \equiv C_9H_{16}$

$$\therefore \text{IHD} = \frac{(9 \times 2) + 2 - 16}{2} = \frac{20 - 16}{2} = 2$$

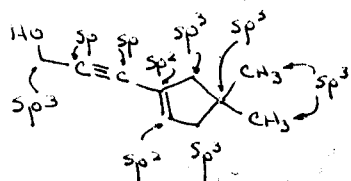
THERE ARE MANY REASONABLE BUT ONE WOULD BE



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

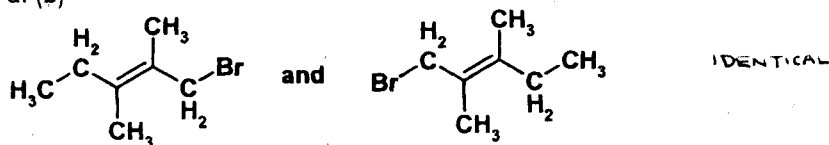


c. Indicate the hybridization of each carbon atom in the above structure (in 2c). (5 marks)

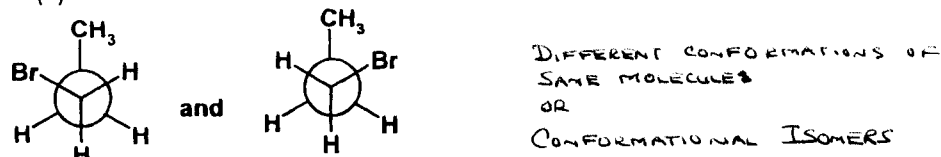


4. (Total 10 marks) For each of the (a-c) below, assign the appropriate terminology (structural isomers, geometric isomers, different conformations of the same molecule, identical) to the following.

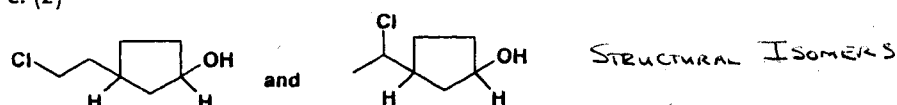
a. (2)



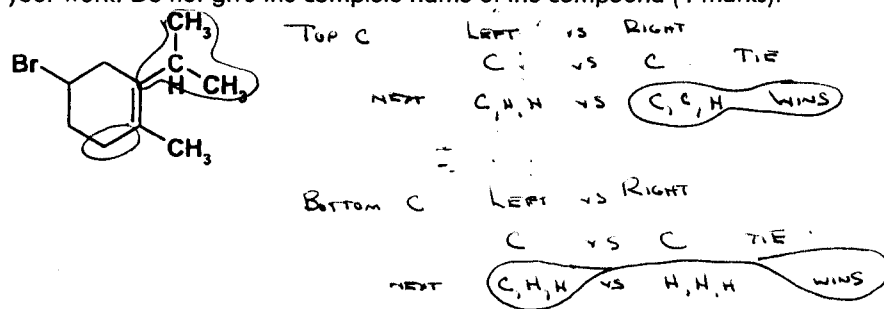
b. (2)



c. (2)



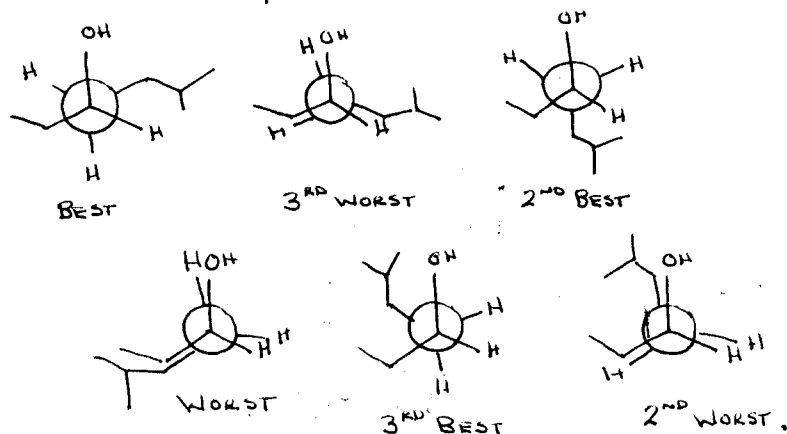
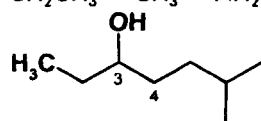
d. Assign the Z- or E- stereochemical descriptor to the following systematically. Show your work. Do not give the complete name of the compound (4 marks).



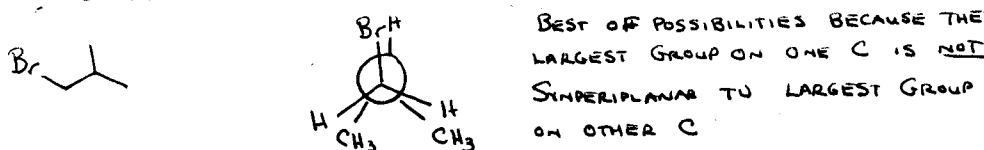
HIGHEST PRIORITY GROUPS OPPOSITE

∴ (E)-

5. Draw the possible Newman projections of all the possible staggered and eclipsed conformations of the following compound, viewed down the C3-C4 bond. Rank them in terms highest to lowest stability. (In terms of size, $C(CH_3)_3 > CH(CH_3)_2 > CH_2CH(CH_3)_2 \approx CH_2CH_3 > CH_3 > NH_2 > OH > F, Cl, Br, I > H$) (12 marks)



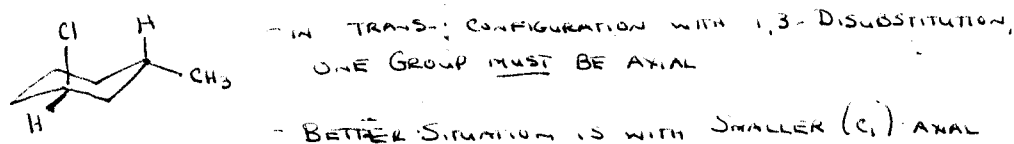
6a. Draw the Newman projection of structure of the **most stable** of the possible eclipsed conformations of 1-bromo-2-methylpropane as viewed down the C1-C2 bond. Give your reasoning why you consider this to be most stable possibility. (4 marks)



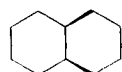
b. In 6a, what is the relationship in orientation between the bromine function and each of the methyl groups. (2 marks) Note: I am looking for terminology more detailed than staggered/eclipsed.

ANTI-CLINAL AND ANTI-CLINAL

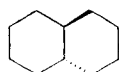
7a. Draw the chair structure of 1-chloro-3-methylcyclohexane in its most stable conformation of its least stable configuration (one structure) (5 marks).



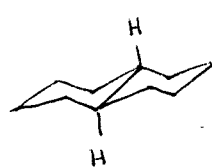
b. Which is the more stable, cis- decalin or trans- decalin? Give reasoning, including structural drawings, to support your choice (6 marks).



cis decalin

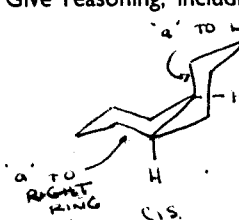


trans decalin



TRANS

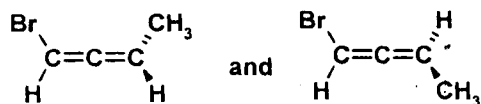
ALL RING JUNCTIONS ARE EQUATORIAL
MORE STABLE



CIS

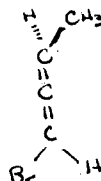
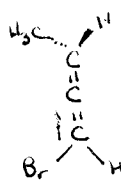
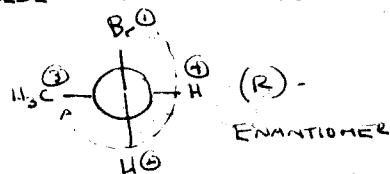
ONE RING JUNCTION ON EACH RING IS AXIAL ON OTHER RING
LESS STABLE

Bonus. (Up to 4 additional marks) As we've mentioned before, allenes are unusual in terms of their bonding at the central carbon. Their stereochemistry is also unusual to a first glance. Can you suggest the stereochemical relationship between the following two allenes (I need more detail than something like 'stereoisomers'), and assign an appropriate stereochemical descriptor to the left one?



and

THESE ARE ENANTIOMERS!



NON-SUPERIMPOSABLE

MIRROR IMAGES

YES, THIS IS WAY AHEAD OF WHERE WE ARE.