

$$\begin{matrix} C_7H_{14} \\ C_7H_{14} \end{matrix}$$

$$\frac{C_7H_{14} - C_7H_{14}}{H_2O} \frac{1 \text{ dou}}{2} = 1 \text{ dou}$$

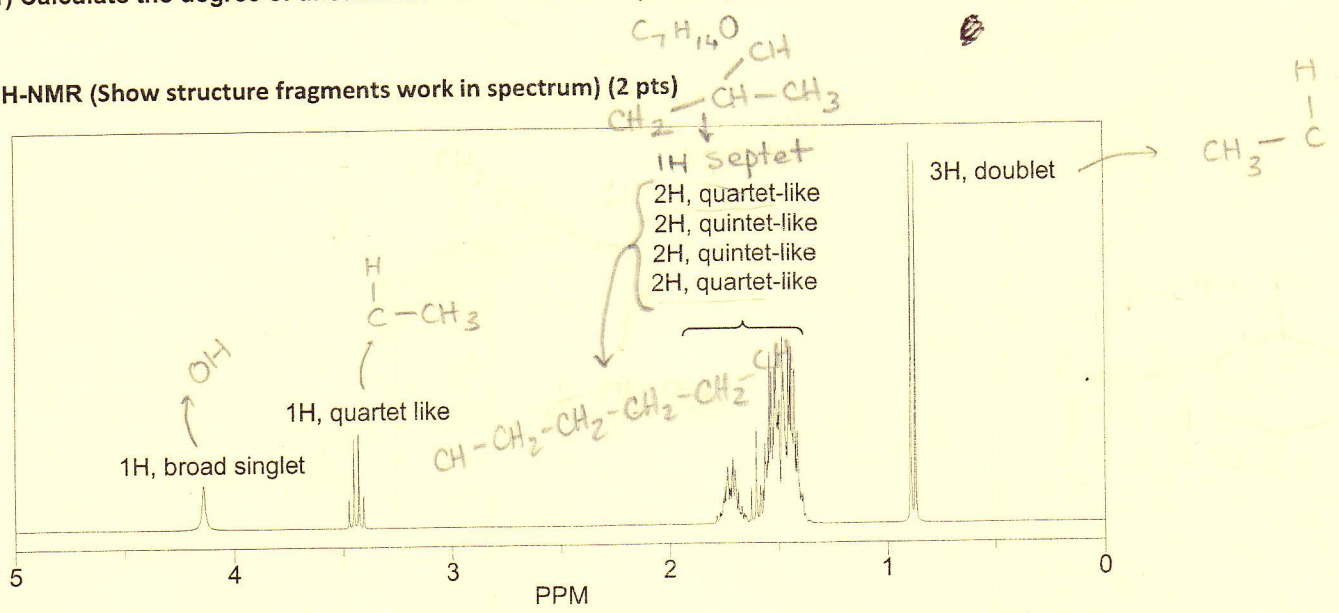
NAME \_\_\_\_\_

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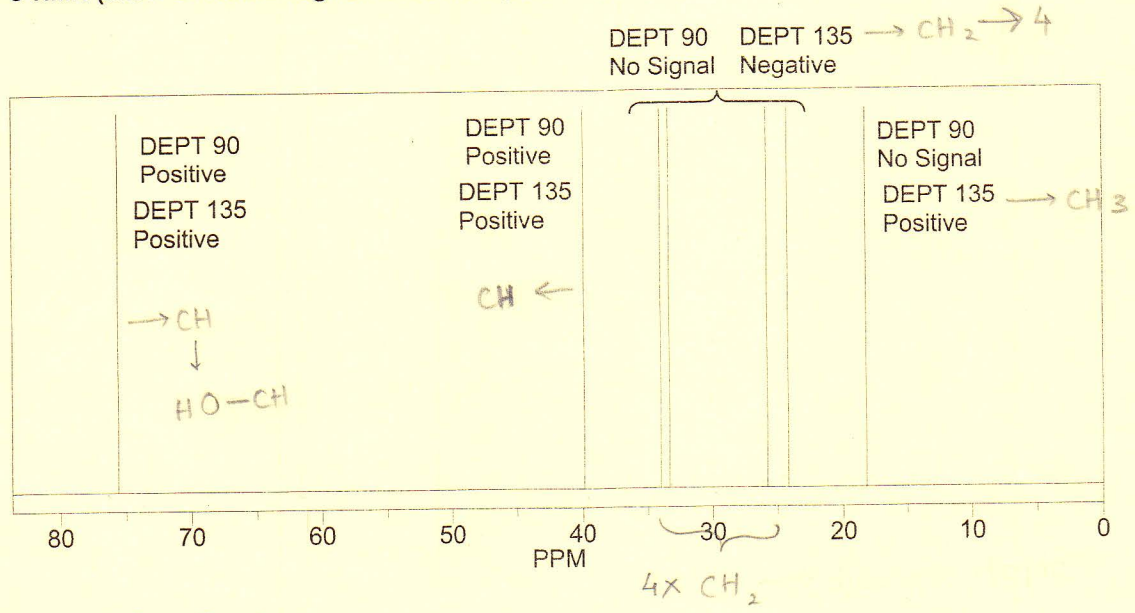
$$(C_7 \times 2) + 2 = 16 - 14 = \frac{2}{2} = 1$$

1) Calculate the degree of unsaturation for the formula ( $C_5H_{12}O$ ) 1 (1 pt)

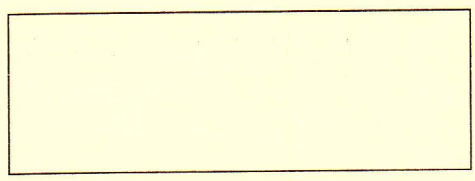
$^1H$ -NMR (Show structure fragments work in spectrum) (2 pts)



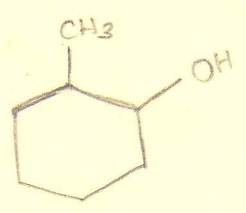
$^{13}C$ -NMR (Show structure fragments work in spectrum) (2 pts)



2) Structure here (2 pts)



Structure MUST BE PLACED Here (show work for credit)

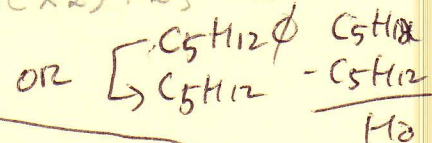


NAME \_\_\_\_\_

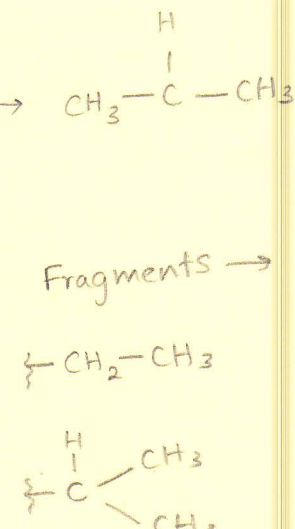
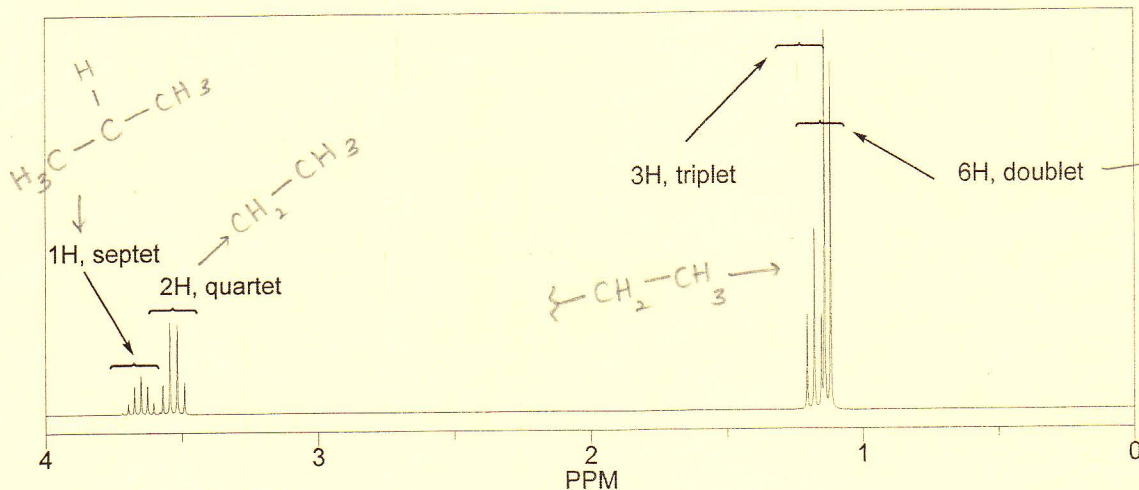
PID \_\_\_\_\_

3) Calculate the degree of unsaturation for the formula (C<sub>5</sub>H<sub>12</sub>O) 0 (1 pt)

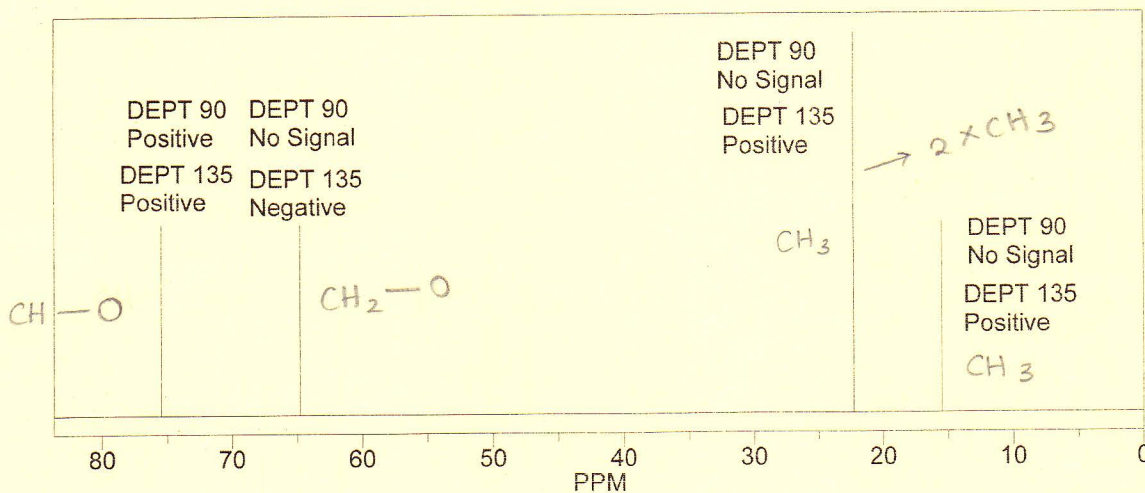
$$\{(5 \times 2) + 2\} - 12H = 0$$



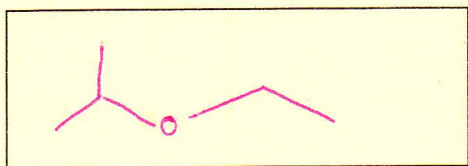
<sup>1</sup>H-NMR (Show structure fragments work in spectrum) (2 pts)



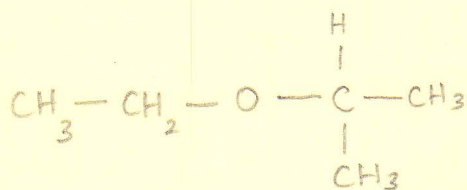
<sup>13</sup>C-NMR (Show structure fragments work in spectrum) (2 pts)



4) Structure here. (2 pts)



Structure MUST BE PLACED Here (show work for credit)



NAME \_\_\_\_\_

PID \_\_\_\_\_

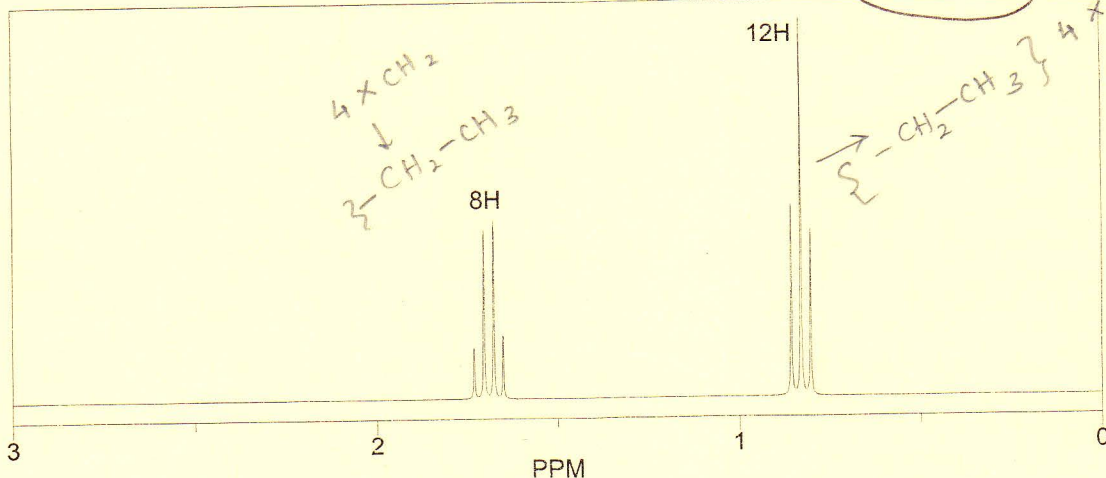
5) Calculate the degree of unsaturation for the formula (C<sub>9</sub>H<sub>20</sub>) (1 pt)

0

$$\{(C_9 \times 2) + 2\} - 20 = 0$$

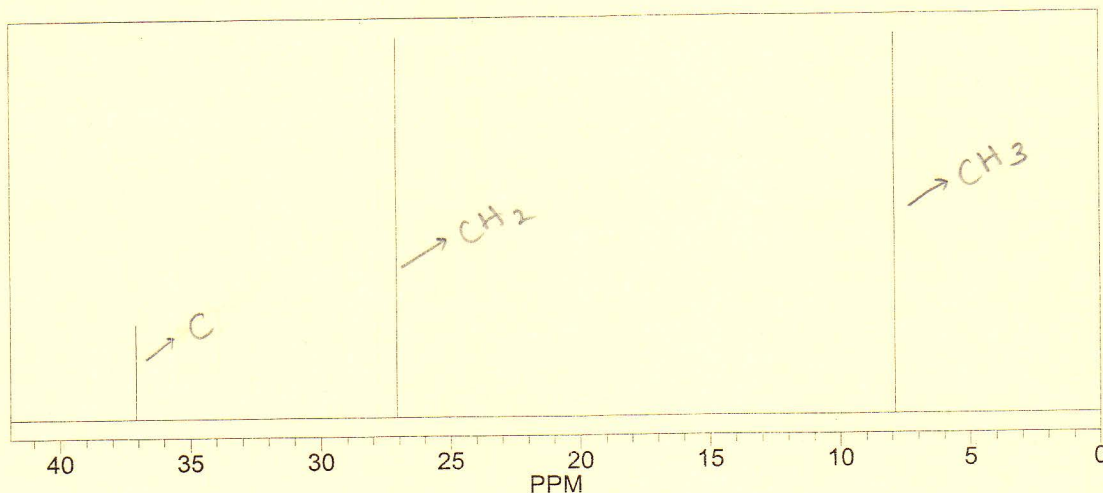
$$\begin{array}{r} C_9H_{20} \\ - C_9H_{20} \\ \hline H_0 \end{array}$$

<sup>1</sup>H-NMR (Show structure fragment work in spectrum) (2 pts)

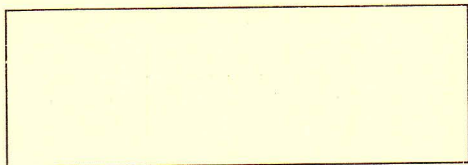


<sup>13</sup>C-NMR (Show structure fragments work in spectrum) (2 pts).

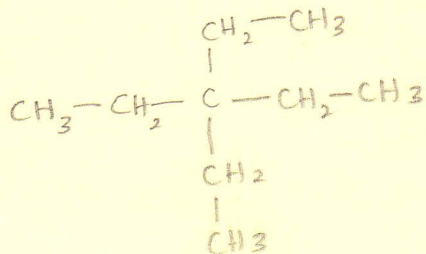
Sometimes the DEPT function stops working or the undergraduate NMRs at your University don't have the DEPT option. This is the situation here.



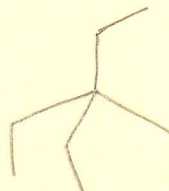
6) Structure here. (2 pts)



Structure MUST BE PLACED Here  
(show work for credit)

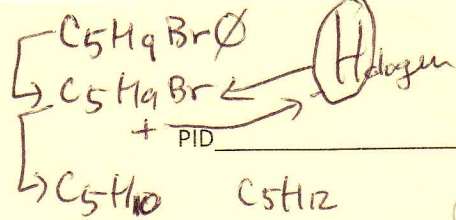


3B





NAME \_\_\_\_\_

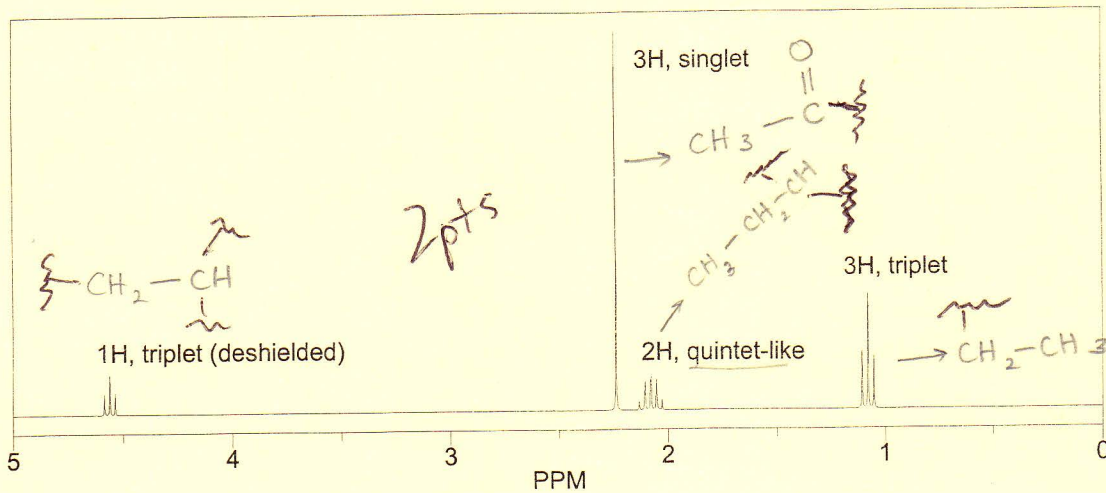


7) Formula ( $C_5H_9BrO$ )

$C_5H_{12}$   
 $- C_5H_{10}$   
 $\frac{H_2}{H_2} \text{ dou} = 1 \text{ dou}$

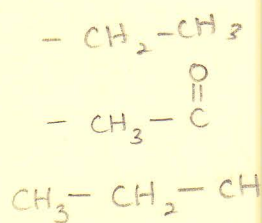
$(C_5 \times 2) + 2 - H_9 - Br_1 = \frac{2}{2}$   
 $= 1$   
 $\downarrow$   
 D.O.U

$^1H$ -NMR (Show structure fragments work in spectrum) (2 pts)



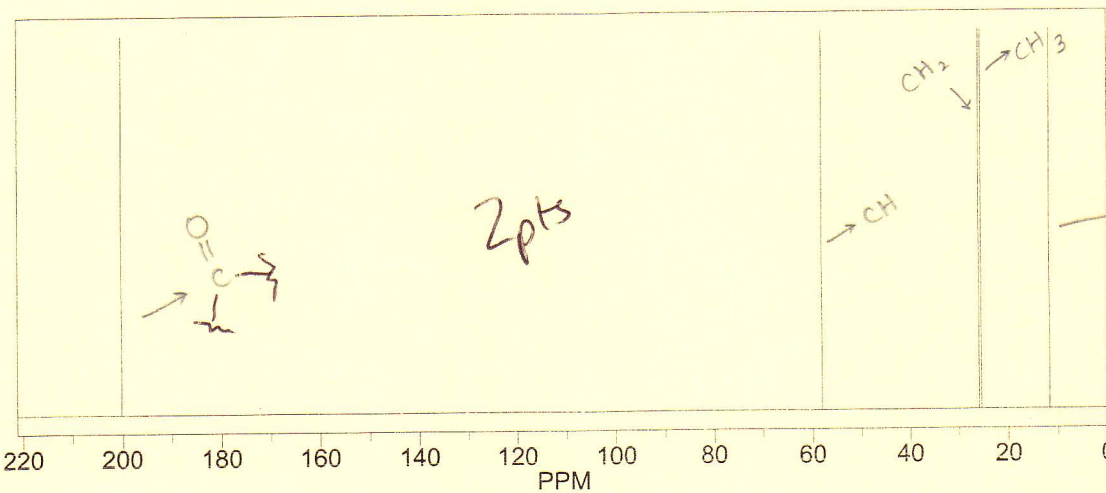
2pts

Fragments



$^{13}C$ -NMR (Show structure fragments work in spectrum) (2 pts).

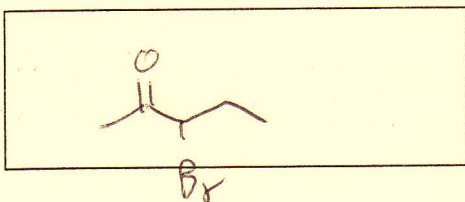
Sometimes the DEPT function stops working or the undergraduate NMRs at your University don't have the DEPT option. This is the situation here.



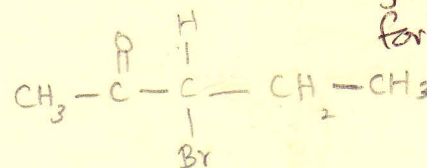
2pts

It would not have mattered whether you got the correct peaks w/ the correct fragment!

8) Structure here (2 pts)



Structure MUST BE PLACED Here (show work for credit)



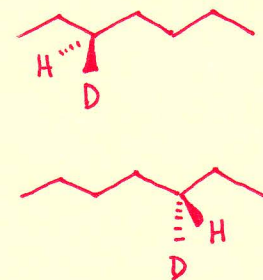
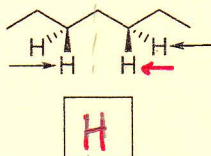
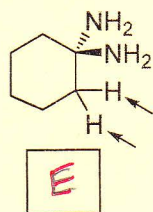
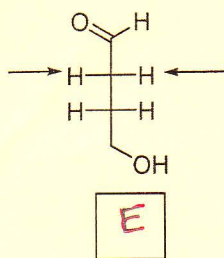
The 5 peak in  $^{13}C$  NMR match the 5-carbons in formula. NO Symm

This was important!

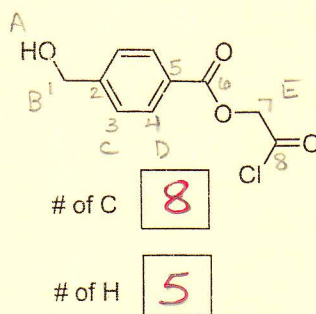
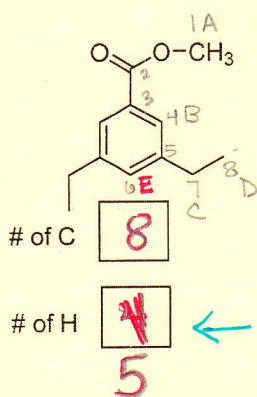
NAME \_\_\_\_\_

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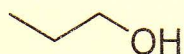
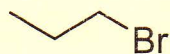
9) Identify the indicated sets of protons as (U)nrelated, (H)omotopic, (E)nantiotopic or (D)iastereotopic (3 pts)



10) How many kinds of nonequivalent carbons (C) and protons (H) are present in the following? That is, how many unique <sup>1</sup>H and <sup>13</sup>C signals will be observed in an NMR spectrum for each. (4 pts)



11) Arrange each set from 1 (slowest) to 3 (fastest) reactant in an S<sub>N</sub>2 reaction. (3 pts)

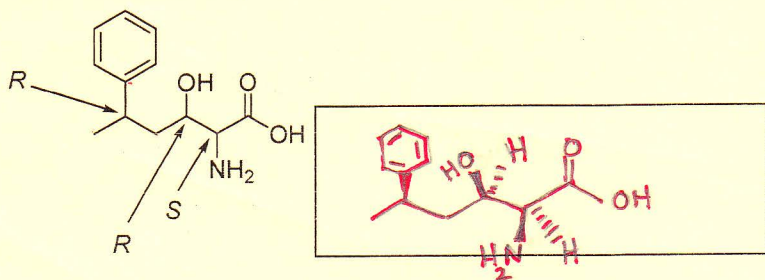


**3**

**2**

**1**

12) Draw the compound below with wedged (—) and/or dashed (····) lines to show the 3-D aspect of the chirality centers below. (3 pts)

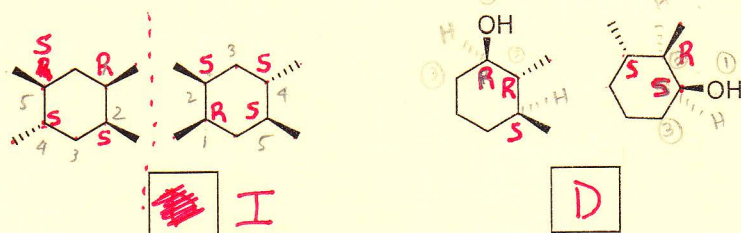




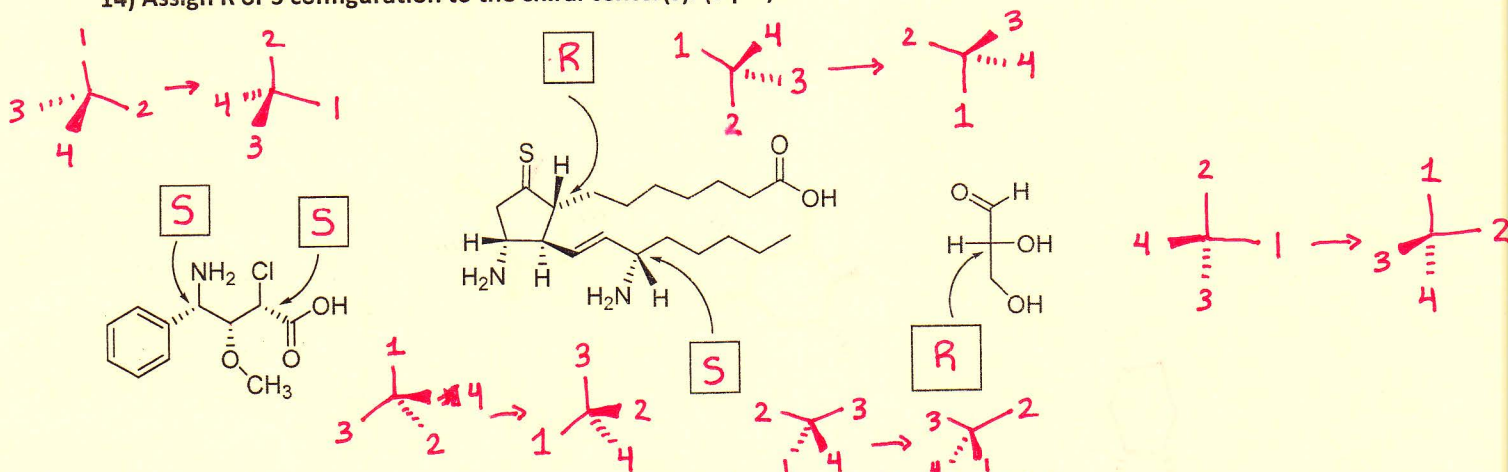
NAME \_\_\_\_\_

PID \_\_\_\_\_

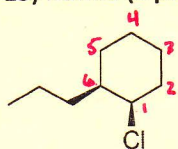
13) Identify whether the following molecules are (E)ntiomers, (I)dentical, (D)iastereoisomers, (C)onstitutional isomers, or (N)ot isomers. Place appropriate letter in the box. (2 pts)



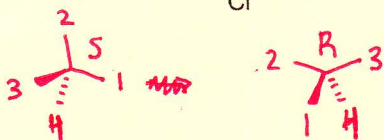
14) Assign R or S configuration to the chiral center(s). (5 pts)



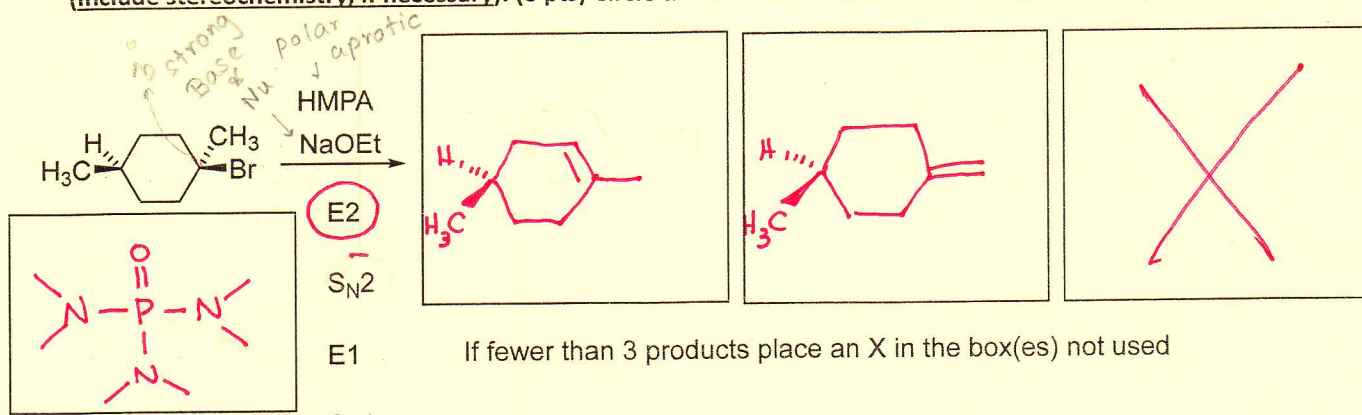
15) Name. (3 pts) Use stereochemical descriptors with their numerical location(s) in the name.



**(1R, 2S)-1-chloro-2-propylcyclohexane**



16) (7 pts total) Under the condition shown, draw ALL the product(s) for the MOST LIKELY reaction mechanism below (Include stereochemistry, if necessary). (6 pts) Circle the reaction mechanism below the arrow. (1 pts) Take your time.



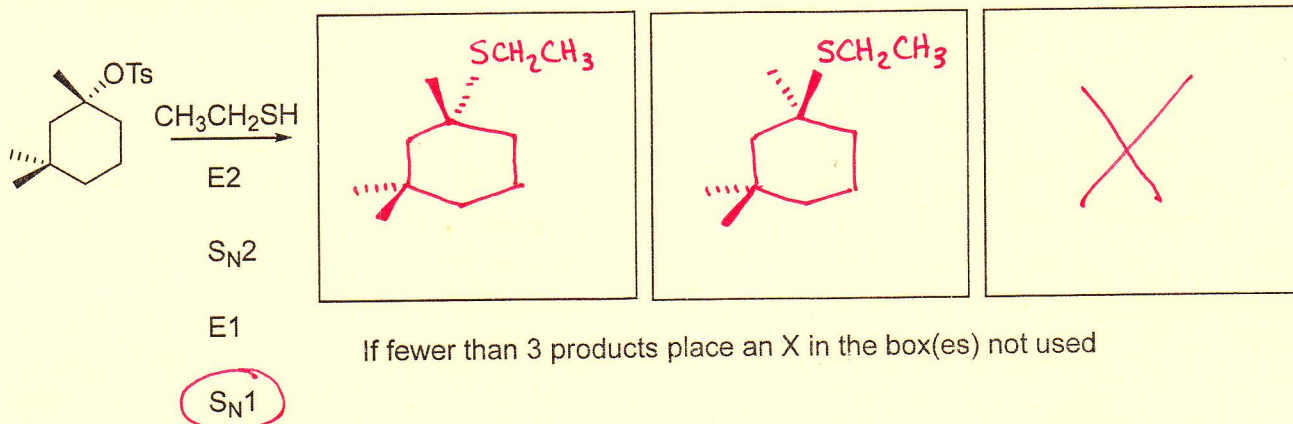
If fewer than 3 products place an X in the box(es) not used

Draw HMPA (2 pt Bonus)  $S_N1$

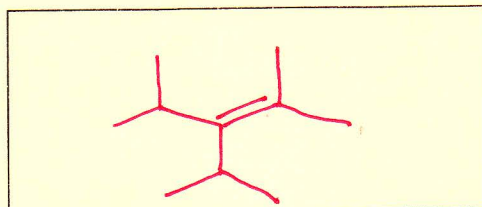
NAME \_\_\_\_\_

PID \_\_\_\_\_

17) (7 pts total) Under the condition shown, draw ALL the product(s) for the MOST LIKELY reaction mechanism below (Include stereochemistry, if necessary). (6 pts) Circle the reaction mechanism below the arrow. (1 pt). Note the reactant above arrow; remember what it can ONLY function as. Take your time.

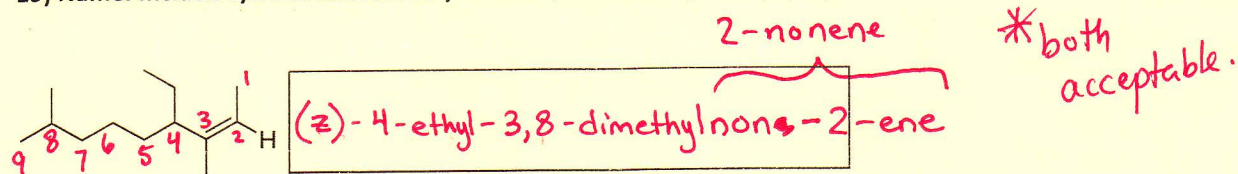


18) Draw. (3 pts)

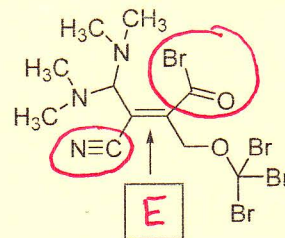
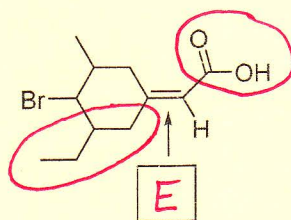
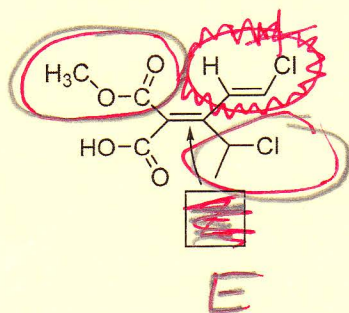


3-isopropyl-2,4-dimethyl-2-pentene

19) Name. Include E/Z stereochemistry in name, if necessary. (3 pts)



20) (9 pts total) Assign E or Z configuration (1 pt). CIRCLE both highest priority groups for in each. (1 pt each circle)

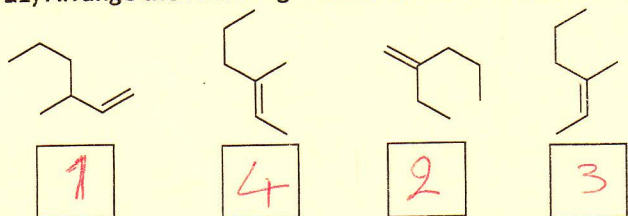




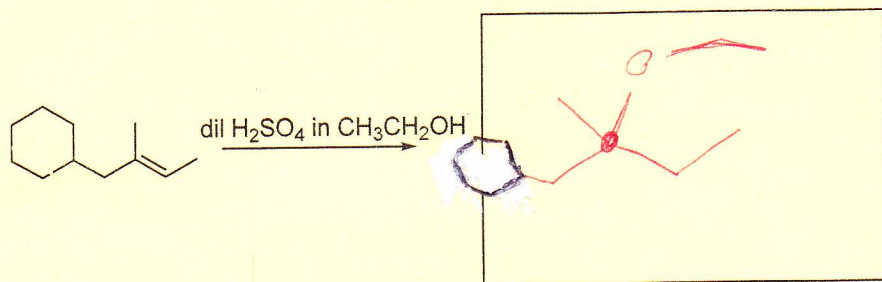
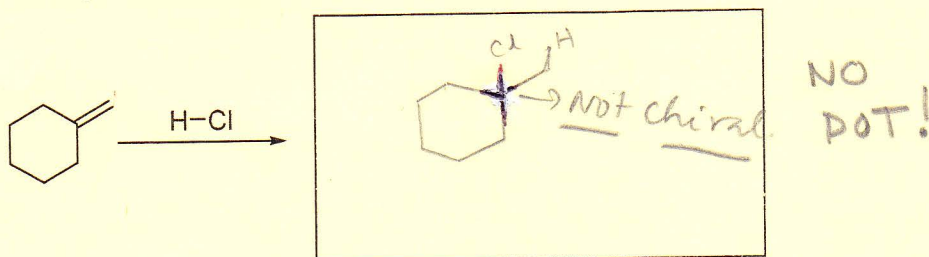
NAME \_\_\_\_\_

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21) Arrange the following in order of increasing stability (1 is LEAST stable; 4 is MOST stable).



22) Draw the MAJOR (most abundant) product made in the reaction. IF NEW STEREOCENTER(S) IS/ARE MADE, PLACE A DOT (●) ON THE CHIRALITY CENTER(S). (6 pts)

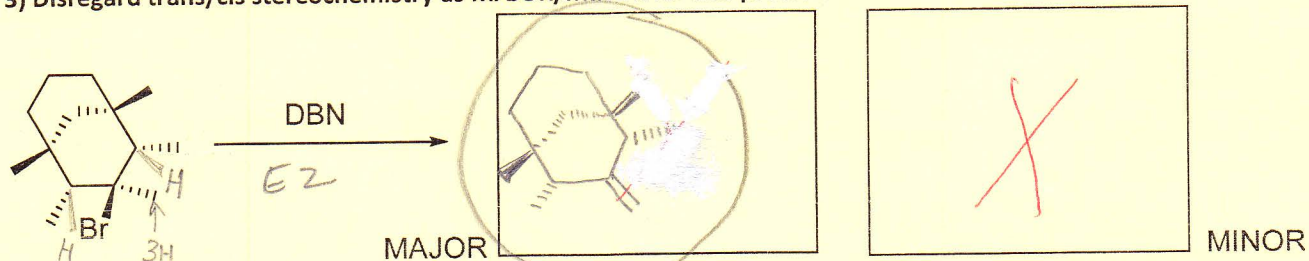


23) Identify the products of the following Elimination reactions. (6 pts)

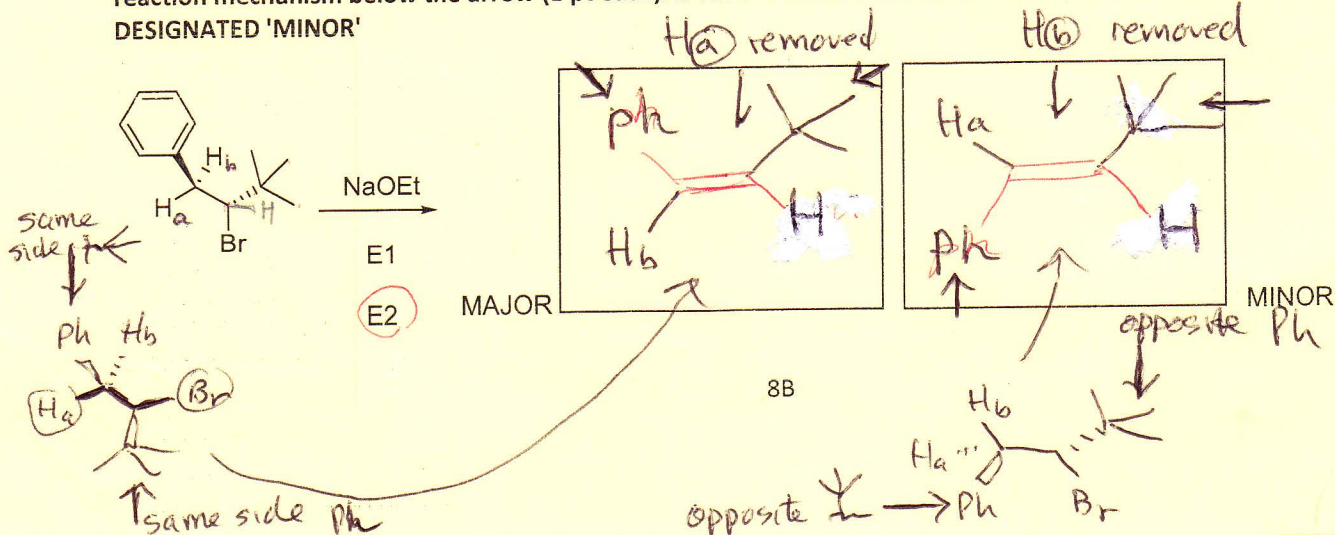
1) If only a MAJOR product is made, draw an X in the MINOR box.

2) If no reaction draw X in both boxes

3) Disregard trans/cis stereochemistry as MAJOR/MINOR for this problem.



24) (7 pts total) Identify the STEREOISOMERIC products of the following Elimination reactions (6 pts). Circle the reaction mechanism below the arrow (1 pt each). If TWO PRODUCTS ARE NOT MADE, THE DRAW AN X IN THE BOX DESIGNATED 'MINOR'



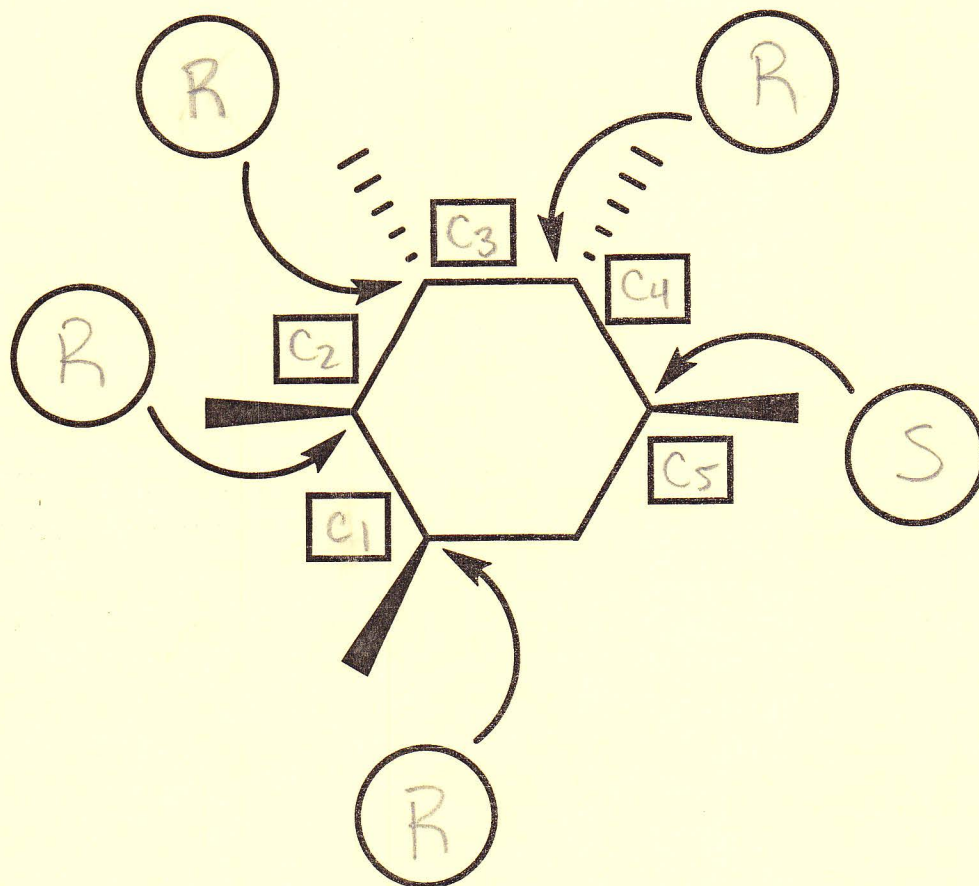


NAME \_\_\_\_\_

PID \_\_\_\_\_

Bonus: Must be completely correct for credit 5 points

Place numbers 1, 2, 3, 4, 5 in the BOXES to designate C1, C2, C3, C4, C5, and write R or S stereochemical descriptors in the CIRCLES of pentamethylcyclohexane below



see pg 9 white key!