

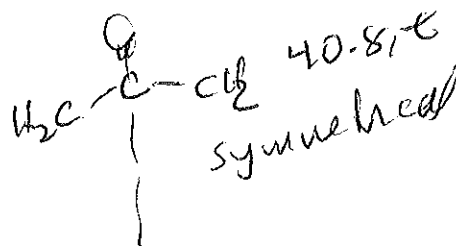
This is an open-book, open notes exam. Please show your work, so you can receive credit for partial structures.

1.  $C_7H_{12}O$

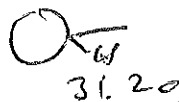
211.8, s  
40.8, t(2)  
34.8, t(2)  
31.2, d  
21.0, q

1.  $11H \Rightarrow 2$   
all H's on C

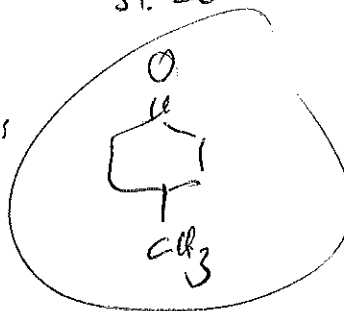
2.  $\begin{matrix} C \\ \diagup \\ C=O \\ \diagdown \\ C \end{matrix}$  ketone probably



also ring - one  
branchy carbon, so



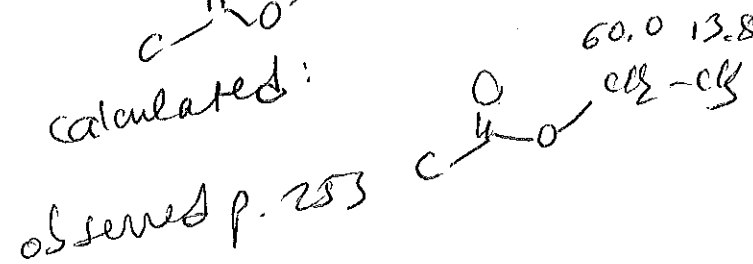
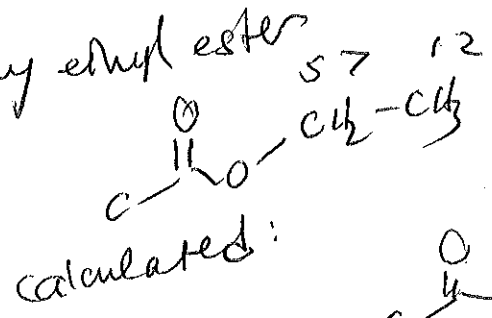
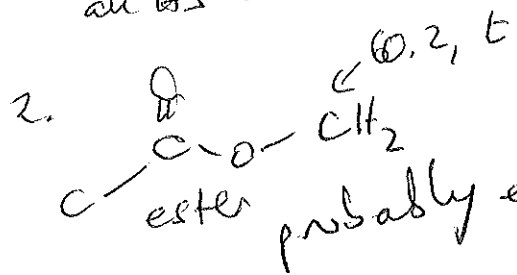
putting it all together:



2. C<sub>7</sub>H<sub>14</sub>O<sub>2</sub>

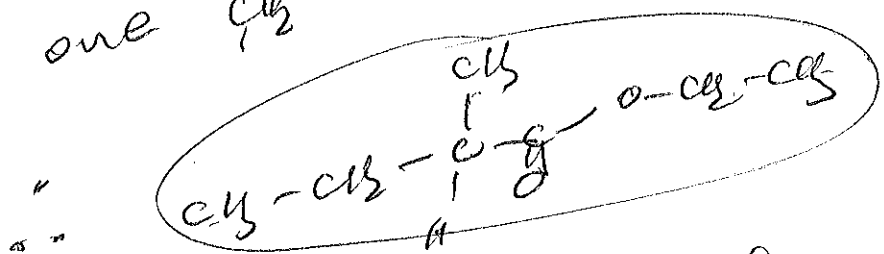
- 176.6, s
- 60.0, t
- 41.1, d
- 26.9, t
- 16.6, q
- 14.3, q
- 11.6, q

1.  $DU = 1$   
all H's on C



3 -  
cf. a There are two more -CH<sub>2</sub>, no symmetry

one  $\begin{matrix} | \\ CH_2 \\ | \end{matrix}$  one  $\begin{matrix} | \\ C-H \\ | \end{matrix}$



cannot be  $\begin{matrix} CH_3 & H \\ & | \\ >C-CH_2-C-O-CH_2-CH_3 \\ & | \\ CH_3 & O \end{matrix}$  because no symmetry

3. C<sub>7</sub>H<sub>17</sub>N

- 52.7, d
- 37.3, t
- 30.6, t
- 28.4, t
- 22.9, t
- 14.1, q
- 10.4, q

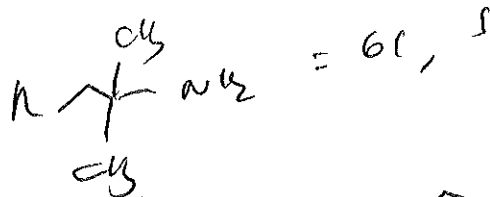
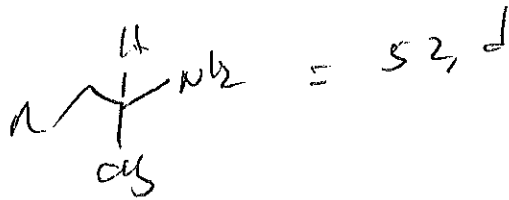
1.  $\text{IHD} = 0$

#H on C = 15    ∴ NH<sub>2</sub>

2. General chemical shift

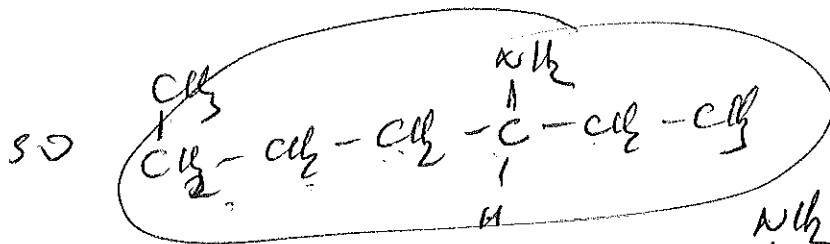
$14 + 29$

3.  $\text{R-CH}_2\text{-NH}_2 = 43, \text{E}$

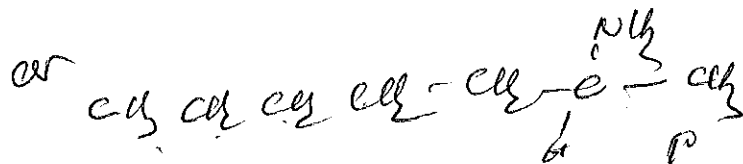


∴ we have  $\text{R-CH}_2\text{-NH}_2$

4. a. methyl groups at 14.1, q normal  
 10.4, q smaller than usual ∴  $\beta$ -shifted



can't be  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-C(NH}_2\text{)-CH}_2\text{-CH}_3$   
 because of no symmetry



calculated 18.24, q