AC/systems

ID # 53

Reg No: | | | | | | | | | |

| Q | Marks | |
|---|---|---|
| | Max | Awarded |
| 1 | 25 | |
| 2 | 15 | |
| 3 | 10 | |
| 4 | 50 | |
| Total | | |

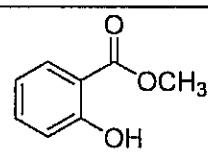
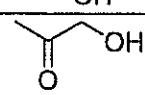
The Open University of Sri Lanka
B. Sc Degree / Stand Alone Programme ~~2010/2011~~
Organic Chemistry - CMU2221
Level 4 - Assignment I – (NBT)
Duration $1^1/_2$ hours



**Thursday 25th November 2010** Time: 4.00 p.m. – 5.30 p.m.

**Answer all questions**

1. (a) Indicate **clearly** the structural feature or functional group responsible for the given IR data for each of the following molecules.

| Compound | IR Absorption | Assignment |
|---|---|---|
| $CH_3(CH_2)_3C{\equiv}C{-}H$ | 2125 $cm^{-1}$ | |
| | 3324 $cm^{-1}$ | |
|  | 1600 $cm^{-1}$ | |
| | 3200 $cm^{-1}$ (br) | |
|  | 1730 $cm^{-1}$ | |

(10 Marks)

(b) Explain why O–H stretching frequency is higher than that of C–O frequency in IR?

(15 Marks)

2. A halogenated compound **A** gave the following peaks in its mass spectrum:
m/e 172(5.4%), 170($M^+$,5.5%) and 91(100%)

(a) What is the halogen present in the molecule?

(b) Give the possible structures of the base peak and the compound A.

| Base peak | A |
|---|---|
| | |

(15 Marks)

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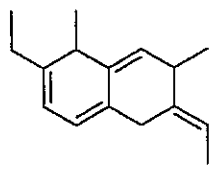
3. Filling the boxes given below with appropriate values, calculate the UV $\lambda_{max}$ value of compound **B** using Woodward – Fieser rules.



**B**

| | | |
|---|---|---|
| Base value for homoannular or cis-oid diene | = 253 nm | |
| Base value for heteroannular or trans-oid diene | = 214 nm | |
| Double bond extending conjugation | = +30 nm | |
| Exocyclic double bond | = +05 nm | |
| Alkyl substituents or ring residues | = +05 nm | |
| Observed UV $\lambda_{max}$ value of compound B | | |

(10 Marks)

4. The IR spectrum and $^1$H NMR spectrum of compound **D** ($C_7H_{10}O$) are provided to you in a separate sheet. *Peaks are expanded and drawn separately to observe the splitting.*

   (a) Giving the relevant wave numbers of the peaks, identify the bonds/functional groups present in **D**.

   Wave number ($cm^{-1}$) Bond/Group

   (b) Indicating the number of protons responsible for each peak, give their approximate chemical shift values.(*Number of boxes given below are more than the required*)

| Chemical shift (δ) | | | | | | |
|---|---|---|---|---|---|---|
| No of protons | | | | | | |

   (c) Elucidate the structure of compound **D**

(50 Marks)

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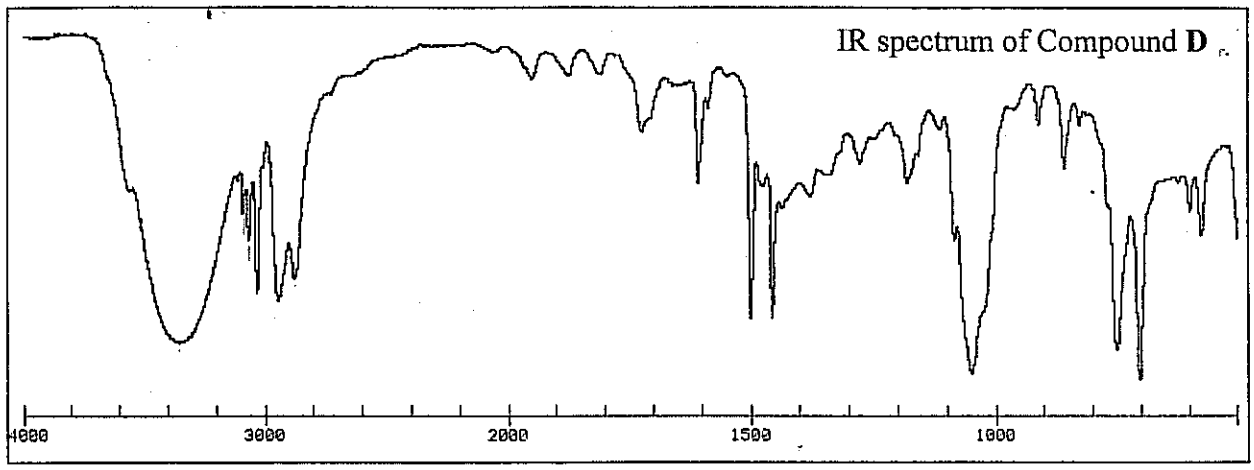


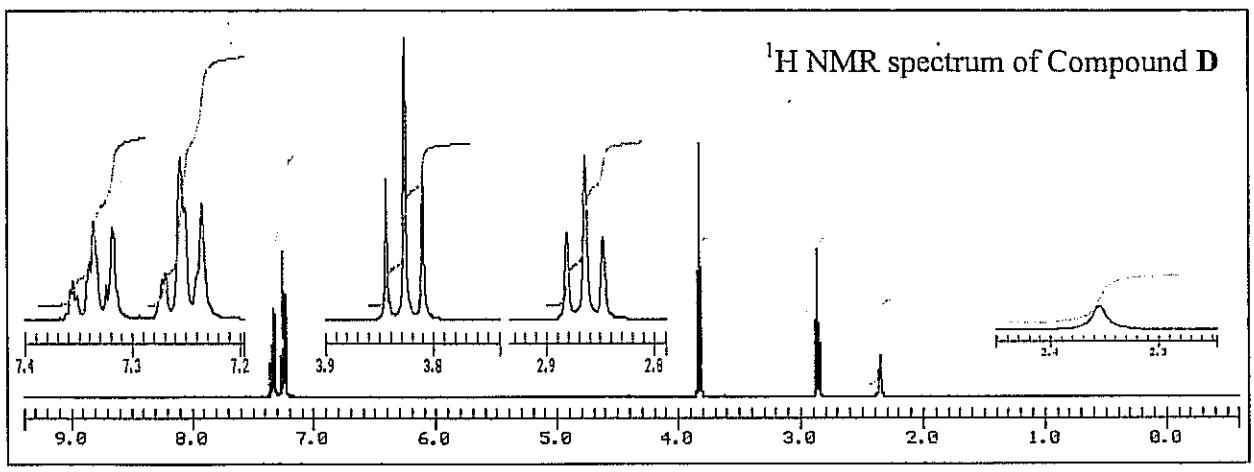


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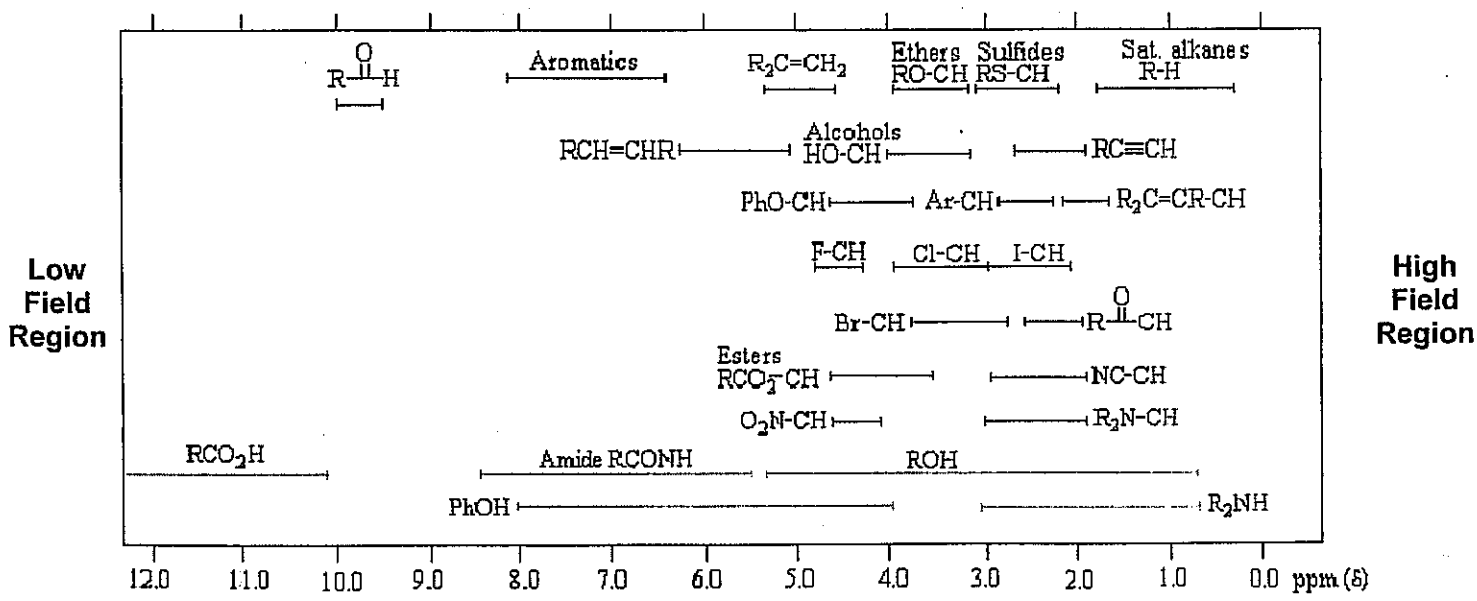
## Proton Chemical Shift Ranges*




* For samples in $CDCl_3$ solution. The δ scale is relative to TMS at δ = 0.