SAMPLE



Reg. No. | | | | | | | | | |

**THE OPEN UNIVERSITY OF SRI LANKA**

**B.Sc. Degree Programme**

**and Stand Alone Courses in Science - 2016/2017**

**CMU2221/CME4221 - Organic Chemistry 1**

**CONTINUOUS ASSESSMENT TEST 1**

| Ques No. | Max. | Marks |
|---|---|---|
| 1 | 20 | |
| 2 | 40 | |
| 3 | 40 | |
| Total | 100 | |

Sunday 30th April 2017 — 2.30 p.m. – 3.30 p.m.

**ANSWER ALL QUESTIONS**

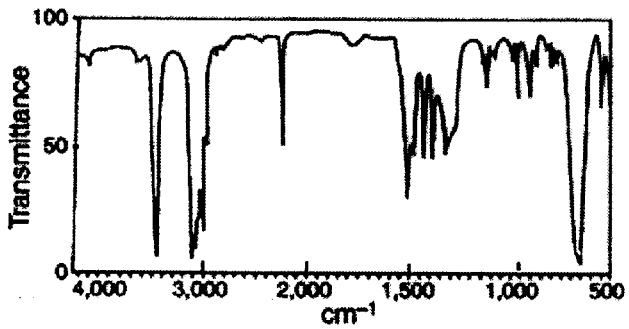
1. (a) Select the compound which best represented by each of the IR spectrum given below.

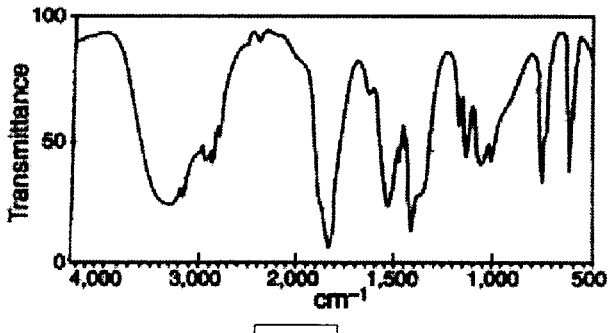
**(A)** $CH_3CH_2C{\equiv}CCH_2CH_3$ **(B)** $C_6H_5CH_2C{\equiv}N$ **(C)** $HC{\equiv}CCH_2CH_2CH_2CH_3$

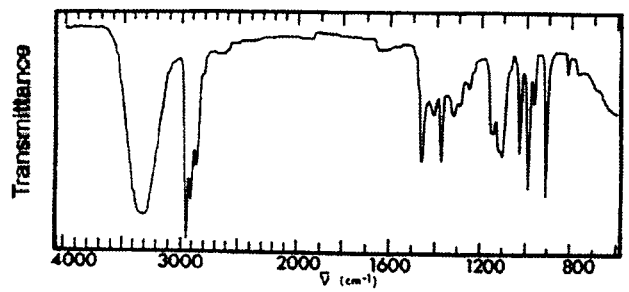
**(D)** $C_6H_5CH_2CO_2H$ **(E)** $C_6H_5CH_2C{\equiv}CH$ **(F)** $CH_3CH_2CO_2CH_2CH_3$

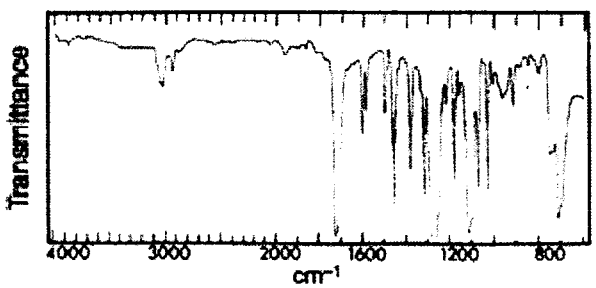
**(H)** $CH_3CH_2CH_2CO_2H$ **(I)** $C_6H_5CH_2CH_2OH$ **(J)** $CH_3CH_2CH_2CH_2OH$

**(K)** $C_6H_5CO_2CH_2C_6H_5$



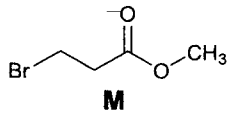



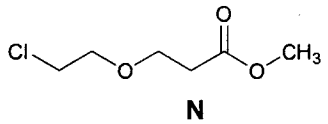

(20 Marks)

Reg. No. | | | | | | | | |

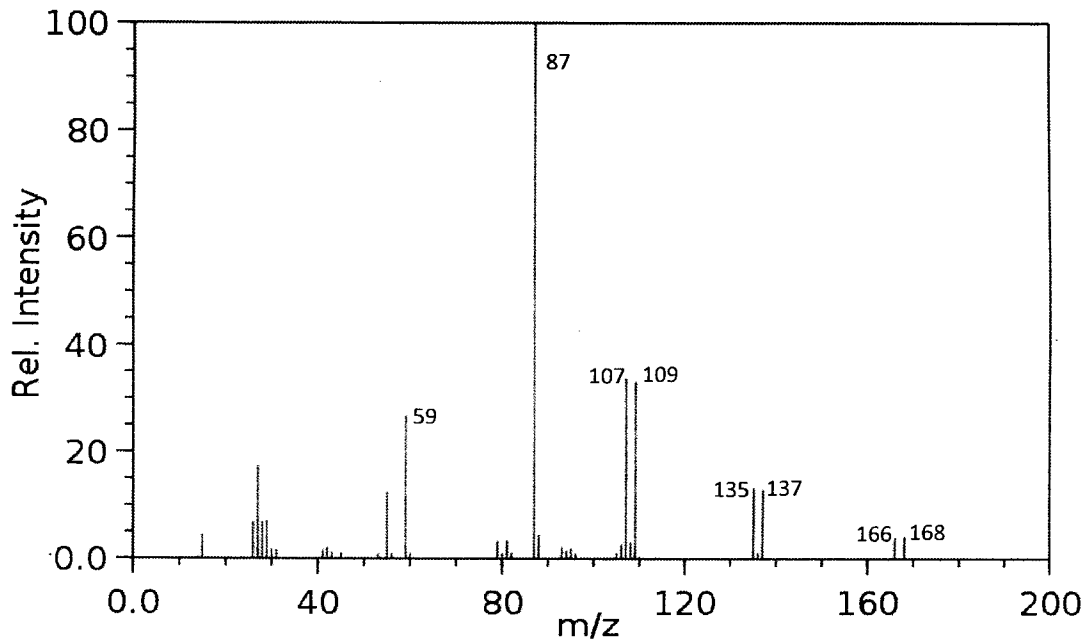
2. (a) Given below is the Mass spectrum of a monohalogenated compound **M** or **N**.




**M**




**N**




(i) Determine whether the Mass spectrum belongs to **M** or **N**? [ ]
Give reasons.

.....

.....

(ii) Give the structures of fragment ions m/z 137, 135, 109, 107, 87, 59.

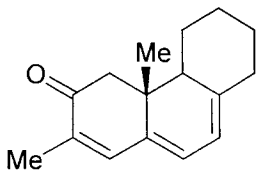
| | | |
|---|---|---|
| m/z 137 | m/z 135 | m/z 109 |
| m/z 107 | m/z 87 | m/z 59 |

(30 Marks)

Reg. No. | | | | | | | | | |

(b) Calculate the expected $\lambda_{max}$ of the compound **C** using Woodward-Fieser rules for α, β-unsaturated ketones given below.

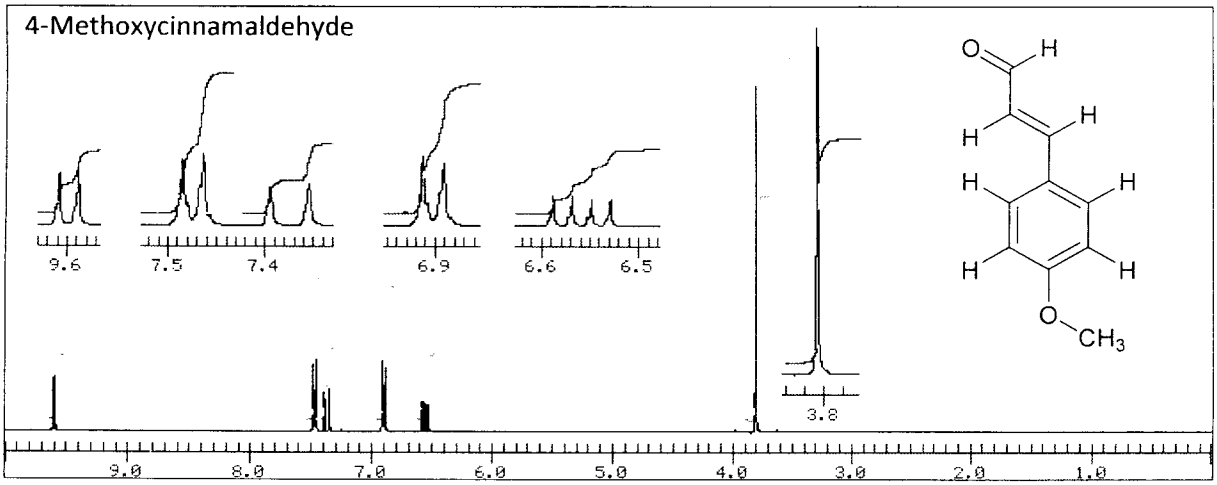
| | | | |
|---|---|---|---|
| Base value for α,β-unsaturated ketone | = | 215 nm | |
| Increments for | | | |
| Double bond extending conjugation | = | + 30 nm | |
| Alkyl group or ring residue at α | = | + 10 nm | |
| β | = | + 12 nm | |
| γ and higher | = | + 18 nm | |
| Exocyclic double bond position | = | + 05 nm | |
| Homoannular diene component | = | + 39 nm | |
| Calculated $\lambda_{max}$ of the compound **C** | = | ///////// | |




(**C**)

(10 Marks)

3. (a) Given below is the structure and the $^1$H NMR spectrum with expansions of all signals of 4-methoxycinnamaldehyde.
Label the different types of protons using the letters **a**, **b**, **c**, **d** …etc. starting from the aldehyde H and assign the signals in the spectrum to those protons.
**Note:** *No explanations are expected*




(30 Marks)

(b) Briefly state how you would distinguish between the compounds in the following pairs using $^1$H NMR spectroscopy. (10 Marks)

(i) $CH_3CH(CH_3)C(=O)H$ and $CH_3CH(CH_3)C(=O)OH$

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.....
.....
.....

(ii) $H_3C$–C$_6$H$_4$–$CH_3$ and $H_3C$–C$_6$H$_4$–$O$–$CH_3$

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Address :.....

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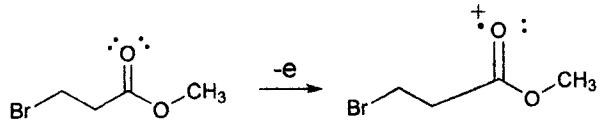
**CMU2221/CME4221 - Organic Chemistry 1 Answer Guide - CAT I**

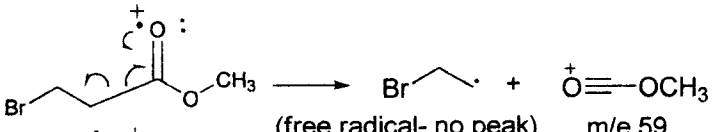
1. C H K J (in clockwise order)

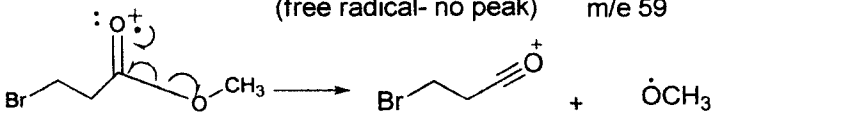
(Aromatic compounds contain the following bands in its IR spectrum;
- Aromatic C=C ring stretching bands : 1500 – 1650 $cm^{-1}$
- A series of overtone bands (weak) : 1650 – 2000 $cm^{-1}$)

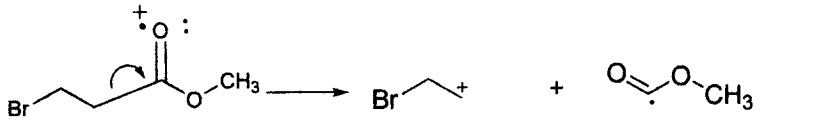
2. (a). (i) Mass spectrum belongs to M. Relative intensities of fragments containing halogen isotopes is 1:1here. Natural abundance of the two Br isotopes is 1:1For Cl ratio of isotopes is 1:3.

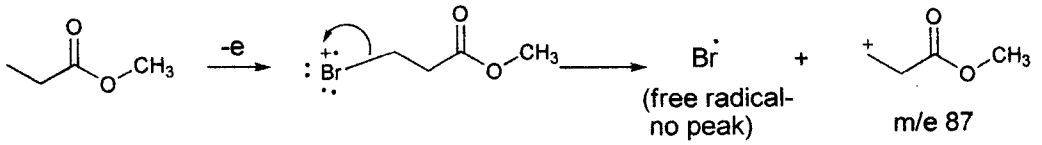
(ii)



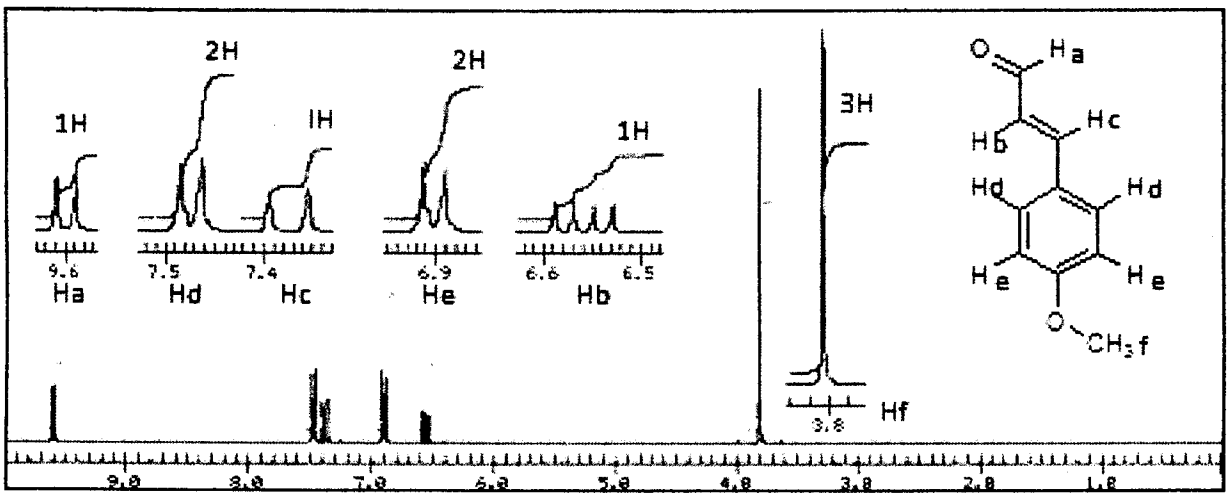




(b)

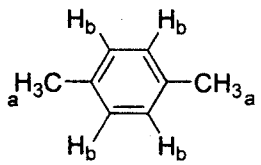
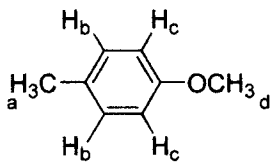
| | | |
|---|---|---|
| Base value for α,β- unsaturated ketone | = | 215 nm |
| Increments for | | |
| Double bond extending conjugation | = | + 30 nm x 2 = 60 nm |
| Alkyl group or ring residue at α | = | + 10 nm x1 = 10 nm |
| β | = | + 12 nm x 0 = 00 nm |
| γ and higher | = | + 18 nm x 3 = 54 nm |
| Exocyclic double bond position | = | + 05 nm x 2 = 10 nm |
| Homoannular diene component | = | + 39 nm x 1 = 39 nm |
| Calculated $\lambda_{max}$ of the compound C | = | **388 nm** |

3. (a)




(b). (i) $D_2O$ exchangeable signal is observed in the spectrum of carboxylic acid only.

(ii)

|  |  |
|---|---|
| 2 signals (4:6) | 4 signals (2:2:3:3) |
| One singlet for $CH_3$ integrating to 6H | Two methyl signals (one deshielded, 3H: 3H) |
| One singlet in the aromatic region | Doublet of doublet in the aromatic region |

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