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

Ques No.	Max.	Marks
1	30	
2	30	
3	40	
Total	100	

THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. Degree Programme

and Stand Alone Courses in Science - 2013/2014

CMU2221/CME4221 - Organic Chemistry 1

CONTINUOUS ASSESSMENT TEST 1

Monday 24th February 2014 12.45 p.m. - 1.45 p.m.

ANSWER ALL QUESTIONS

1. (a) Giving one reason state how you would distinguish between the compounds in the following pairs using IR spectroscopy.

(i) $CH_3C{\equiv}CCH_3$ (**A**) and $CH_3CH_2C{\equiv}CH$ (**B**)

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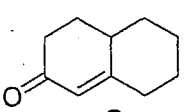
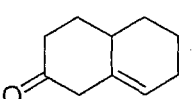
(ii)  (**C**) and  (**D**)

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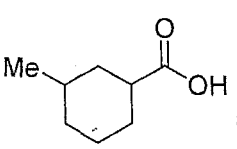
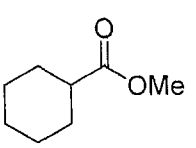
(iii)  (**E**) and  (**F**)

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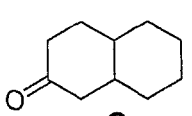
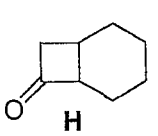
(iv)  (**G**) and  (**H**)

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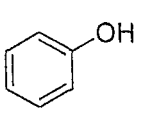
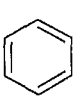
(v)  (**I**) and  (**J**)

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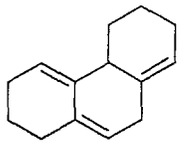
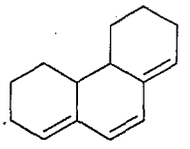
(30 Marks)

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

2. (a) Which compound in each of the following pairs shows higher λ_{max} in UV-Vis spectroscopy? Give your reason.

(i)  and 

K L

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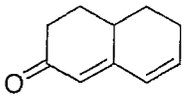
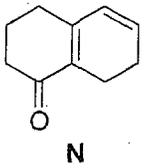
(ii)  and 

M N

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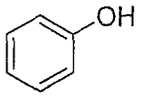
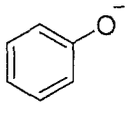
(iii)  

O P

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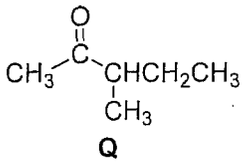
(15 Marks)

(b) Compound **Q** showed peaks at m/z 85, 72 and 57 in its mass spectrum. Draw the structures of fragment ions responsible for these peaks.



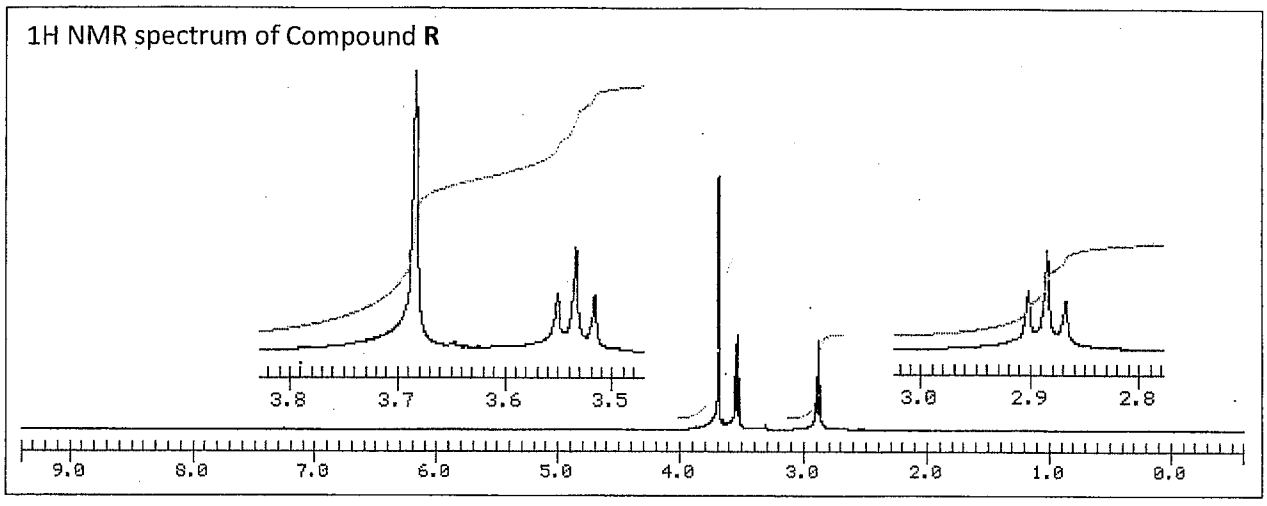
Q

m/z 85	m/z 72	m/z 57

(15 Marks)

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

3. ^{1}H NMR spectrum of compound **R** ($C_4H_7O_2Br$) along with some useful expansions is given below. The IR spectrum of **R** showed a strong absorption at 1735 cm^{-1} among other peaks while no absorptions are observed above 2900 cm^{-1}.



(a) What is the possible functional group present in **Q?**

(b) What information you get from the statement, "no absorptions are observed above 2900 cm^{-1}"? .....

.....

(c) How many different types of protons are there in compound **Q**? Label them using A, B, C, D etc.

(d) How many protons are responsible for each peak?

(e) What are the different spin systems present in this molecule?

(f) Deduce the structure of compound **H**.

(40 Marks)

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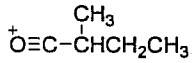
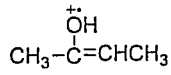
CAT I Answer guide

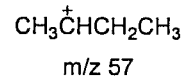
1. (a) (i) Due to the presence of acidic H (≡C-H) **B** only gives a sharp absorption band around 3300 cm^{-1}
(ii) Carbonyl group of **C** is conjugated with a double bond. Therefore its carbonyl frequency is lower than that of **D**.
(iii) **F** is an ester and **E** is a carboxylic acid. A broad band around 3000 cm^{-1} is observed in IR spectra of **E** only.
(iv) Carbonyl group of **H** is attached to a four membered ring which has angle strain. Therefore carbonyl stretching frequency in **H** is higher than that in a six membered ring.
(v) A broad absorption band for O-H stretching can be observed in the IR spectrum of **I** only.

2. (a) (i) **L** ; Chromophore of **L** has an extra double bond in conjugation with the diene. Therefore λ_{max} is higher in **L**
(ii) **N** ; N contains a homoannular diene component while **M** contains a heteroannular diene component. Out of these two increments for homoannular component is higher. Therefore λ_{max} is higher in **N**.
(iii) **P**; negative charge on oxygen atom on p can delocalized in the benzene ring and results in conjugation. This leads to higher λ_{max} in **P**.

(b)


m/z 85


m/z 72


m/z 57

3. (a) C=O or ester

(b) No –OH, no alkene protons, no alkyne proton

(c) 3 different peaks,
B – triplet in between δ 3.5 – 3.6 ppm
A – singlet around δ 3.7 ppm
C – triplet around δ 2.9 ppm

(d) A:B:C = 3:2:2

(e) CH_3- , -CH_2-CH_2-

(f)