M.Sc.-I/Chemistry-102C/18

M.Sc. 1st Semester Examination, 2018

CHEMISTRY

(Organic Chemistry)

Paper : CHEM-102C

Course ID : 11452

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

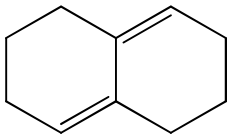
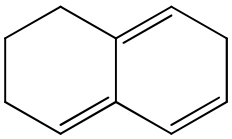
Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five*: 2×5=10

(a) Draw a qualitative MO diagram for the following wave function indicating the nodal plane and also predict whether C_2 and σ are symmetric or antisymmetric:

$\Psi = 0{\cdot}37\ \phi + 0{\cdot}6\ \phi_2 - 0{\cdot}6\ \phi_3 - 0{\cdot}37\ \phi_4$.

(b) Calculate λ_{max} value for the following compounds :


,

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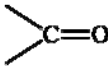
(c) Mention the point group of BCl_3 and CCl_4.

(d) What is Larmor frequency?

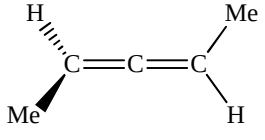
(e) Define the term with suitable example: 'Conformationally biased system'.

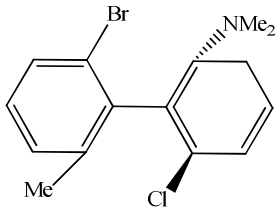
(f) Explain why the IR spectrum of glucose shows no significant absorption on the  stretching vibration region.

(g) Draw the stereo-chemical structure in Fischer form of (R)–1-Bromo-1-phenyl ethane and (R)-Alanine.

2. Answer *any four*: 5×4=20

(a) (i) Assign R,S–designations of the following compounds:



and


(ii) 'Gauche form of butane is chiral but butane itself is optically inactive'.— Explain.

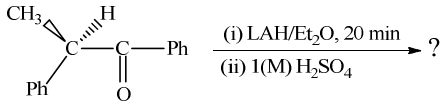
(iii) Calculate expected apparent mass of the metastable ion produced when m/z 77 decompose by loss of CH ≡ CH to m/z 51. 2+1+2=5

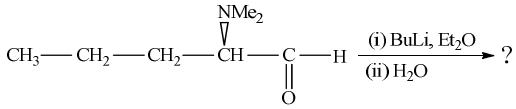
(b) (i) Write down the interaction matrix allylcation.

(ii) Calculate the approximate energy values of the MO.

(iii) Assign the MOs as bonding and antibonding. 1+2+2=5

(c) Predict the products with mechanism and explanation:

(i) 

(ii) 

(iii) What do you mean by conformational energy? 2+2+1=5

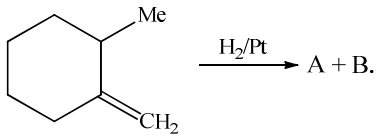
(d) (i) Explain with suitable example McLafferty rearrangement cleavage in mass spectroscopy.

(ii) Write the Winstein-Holness principle and derive this equation of any feasible reaction. 2+3=5

(e) (i) Compare the stability of *cis* and *trans* 1, 3 Dimethylcyclohexane.

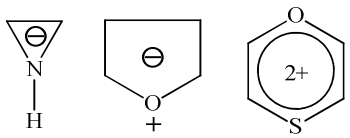
(ii) Explain the peaks appearing at m/z 69,67 & 93 in the mass spectrum of β-myrcene. 2+3=5

(f)

(i) 

State the major product with explanation.

(ii) Predict whether the following compounds are aromatic, non-aromatic or anti-aromatic:



(iii) Predict the chemical shift position for the carbon in 3-Heptanone. 2+2+1=5

3. Answer *any one* question: 10×1=10

(a) (i) An Organic compound which is pale yellow colour, is slightly acidic in nature having MF–$C_6H_5NO_3$ and gives the following spectral results:

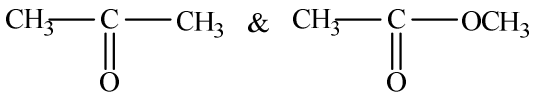
- UV: $\lambda_{max} - 280nm, \epsilon_{max} - 6600$
- IR (cm^{-1}): 3460 (broad, sharp), 3035 (m), 1608 (m), 1505 (m), 1510 (s), 1360 (s), 1320 (s) & 740 (s). The band at 3460 cm^{-1} does not shift even on diluting the sample.
- ^{1}HNMR: $\delta_{6\cdot9}$1H(s) , $\delta_{6\cdot21}$ 4H(s) unsymmetrical pattern. Deduce the structure of the compound on the basis of the spectroscopic and spectrometric results.

(ii) Writes note on "off resonance".

(iii) Why is solvent choosen important for NMR spectroscopy? 5+3+2=10

(b) (i) How will you account for the appearance of prominant peak at m/z 31,42 and 70 in the mass spectrum of *n*-Pentanol?

(ii) How would you distinguish between the following pairs of compounds by NMR–spectroscopy?



(iii) 'The unsaturated aldehydes CH_3–$(CH = CH)_n$–CHO have UV absorption spectra that depends on the value of *n*, the λ_{max} being 220, 270, 312 and 343 nm as '*n*' changes from 1 to 4.'— Explain.

(iv) Write down the two advantages of electron ionization process. 5+2+2+1=10

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