

P. Pages : 3

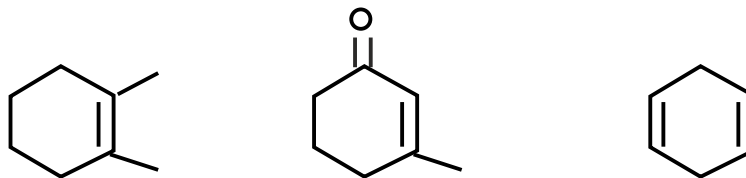
Time : Three Hours



GUG/W/24/11448

Max. Marks : 80

1. a) Explain Woodward Fisher rules with examples. Calculate λ_{\max} for the following molecules. 8



- b) Write note on photoelectron spectroscopy. How it is useful to determine the structure. 8

OR

- c) Discuss the different types of electronic transitions. 4

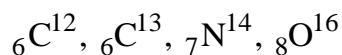
- d) State and explain Frank-Condon principle. 4

- e) Write note on Auger electronic spectroscopy. 4

- f) Explain the following terms – 4

- | | |
|-----------------------------|------------------------|
| i) Auxochromes | ii) Chromophores |
| iii) Bathochromic shift and | iv) Hypsochromic shift |

2. a) Discuss the principle of NMR spectroscopy and differentiate the following Nuclei as a NMR active and in active. 8



- b) What is spin-spin coupling? Explain the application of 'Karplus' equation for coupling constant. 8

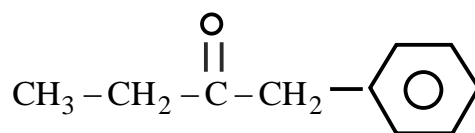
OR

- c) Match the correct pairing of chemical shift values. 4

- | | |
|----------------------|------------------------|
| i) Aldehydic proton | a) $\delta = 0.9$ ppm |
| ii) Acidic proton | b) $\delta = 12.0$ ppm |
| iii) Aromatic proton | c) $\delta = 9.0$ ppm |
| iv) Alkyl proton | d) $\delta = 7.0$ ppm |

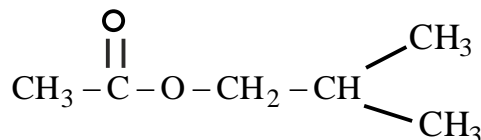
- d) Explain coupling constant with respect to first order and second order spectra. 4

- e) What are homotopic, enantiotropic & diastereotopic protons? Quote one example each. 4
- f) Corelate the following data of NMR to the given molecule specific protons with given data 4



$\delta = 0.9$ t, 3H, $\delta = 2.1$ quartet 2H, $\delta = 2.2$, S & $\delta = 7.1$ S

3. a) Discuss DEPT for given molecule at 45, 90 & 135. 8



- b) What is FT-NMR ? Explain two dimensional spectroscopy with respect to cosy. 8

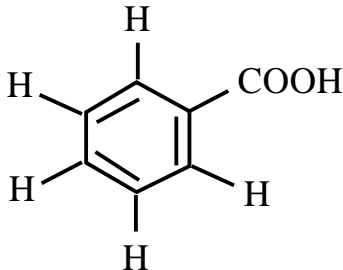
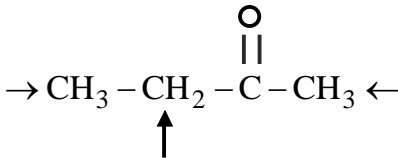
OR

- c) What is Nuclear Overhauser effect. 4
- d) Write a note on Nuclear quadrupole resonance. 4
- e) Deduce the structure of molecule from given data M.F. $\text{C}_{10}\text{H}_{20}$ 4
 $\delta = 1.1$ ppm (12H, S) & $\delta = 1.2$ (8H, S)
- f) State splitting pattern to the given fragments. 4
 $-\text{CH}_2 - \text{CH}_2 -$, $\text{CH}_3 - \text{CH}_2 -$, $-\text{CH} - \text{CH}_2 -$, $-\text{CH} - \text{CH} -$

4. a) Explain Brag's condition. Discuss Debye Scherrer method for x-ray analysis. 8
- b) Explain the structure of proteins on the basis of Ramchandran plot. 8

OR

- c) Distinguish the electron and neutron diffraction in short. 4
- d) Explain Laue method for the x-ray analysis. 4
- e) Explain Wierl equation. 4
- f) Determine atomic spacing in a NaCl crystal having cubic lattice, 4
 Data – density = $2.16 \times 10^3 \text{ kg / m}^3$,
 Average mass of Na = $3.82 \times 10^{-26} \text{ kg}$
 & average mass of Cl = $5.89 \times 10^{-26} \text{ kg}$

5. a) From the following which transition required minimum energy. 2
 $\sigma \rightarrow \sigma^*$, $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$
- b) Bathochromic & hypsochromic shift is related to parameter of light. 2
- c) Identify most deshielded proton from the given molecule. 2
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- d) Calculate chemical shift value in Hertz (Hz) of $\delta = 2.5$ & instrumental frequency is 90 MHz. 2
- e) What is anisotropic effect. 2
- f) Indicate splitting pattern of ^{13}C -NMR in the following molecule 2
- 
- g) Identify the following equation 2
 $n\lambda = 2d \sin \theta$
- h) Write Wierl equation. 2
