

**2023-24****Time - 3 hours****Full Marks - 60**

*Answer all groups as per instructions.  
Figures in the right hand margin indicate marks.  
Candidates are required to answer  
in their own words as far as practicable.*

**GROUP - A**

1. Answer all questions and fill in the blanks as required. [1 × 8]
- (a) 1 nanometer = \_\_\_\_\_ Å
- (b) What is the basic value of  $\lambda_{\max}$  of  $\alpha, \beta$ -unsaturated Ketone according to Woodward-Fieser rule ?
- (c) Hydrogen bonding brings \_\_\_\_\_ shift in the wave number of absorption in IR spectroscopy.
- (d) If a molecule has a centre of symmetry, then molecule is IR \_\_\_\_\_.
- (e) How many equivalent sets of protons in propene ?
- (f) The largest peak in the mass spectrum is called \_\_\_\_\_.
- (g) Give two examples of polysaccharides.
- (h) Define anomers.

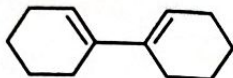
[ 2 ]

GROUP - B

2. Answer any eight of the following within two or three sentences each.

[1½ × 8]

(a) Find the  $\lambda_{\max}$  of the compound :



- (b) How geometrical isomers of 1,2-dichloroethene distinguished by IR spectroscopy ?
- (c) Give the relationship between Absorbance (A) and Transmittance (T).
- (d) Calculate the number of modes of vibrations in methane molecule.
- (e) What is coupling constant ?
- (f) A molecule of even molecular mass must contain \_\_\_\_\_ or \_\_\_\_\_ number of nitrogen atoms. A molecule of odd molecular mass must contain \_\_\_\_\_ number of nitrogen atom.
- (g) What are meta-stable peaks ?
- (h) Explain why tetramethyl silane is used as reference compound in NMR spectrum.
- (i) What are epimers ? Give an example.
- (j) What are Bathochromic and Hypsochromic shifts ?

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GROUP - C

3. Answer any eight of the following within 75 words each. [2 × 8]

- (a) When a uv light is passed through the given solution, the intensity of light is reduced to 50%. Find the absorbance.
- (b) How can you distinguish between propanal and propanone by IR spectroscopy ?
- (c) How can you know the compound is aromatic or not by IR spectroscopy ?
- (d) Explain  $\nu_{C=O}$  str increases with increase in ring-size from cyclopropanone to cyclohexanone.
- (e) Explain the anisotropic effect in alkyne.
- (f) What is Killiani-Fischer synthesis ?
- (g) How can you distinguish between cis-trans isomers by uv spectroscopy ?
- (h) What are hypochromic and hyperchromic shifts ?
- (i) A compound having molecular formula  $C_4H_9Br$  gives nmr signals  $\delta \rightarrow 1.04$  (6H, doublet),  $\delta \rightarrow 1.95$  (1H, multiplet) and  $\delta \rightarrow 3.33$  (2H, doublet). Suggest the structure of the compound.
- (j) How can you convert fructose to glucose ?

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**GROUP - D**

4. Answer any four of the following. [6 × 4]
- (a) Discuss about different types of electronic transitions in uv spectroscopy.
- (b) State and derive Lambert-Beer's Law. Give its limitations.
- (c) Discuss about the fundamental and non-fundamental molecular vibrations in IR spectroscopy.
- (d) Write notes on : [3 × 2]
- (i) Finger print region and its significance
- (ii) Vibrational frequency
- (e) Write notes on : [3 × 2]
- (i) Spin-Spin coupling
- (ii) Chemical shift
- (f) Write notes on : [3 × 2]
- (i) Mechanism of mutarotation
- (ii) Discuss about the fragmentation pattern of Neo-Pentane
- (g) Determine the ring size of the glucose with chemical reactions.