

2021

(July)

CHEMISTRY

(Honours)

(Part-B : Organic Chemistry)

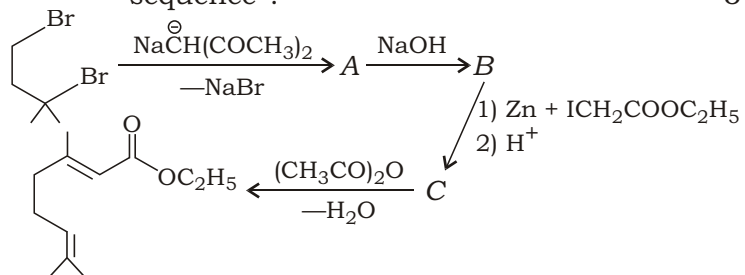
(Chem-H-601)

Marks : 37

Time : 2 hours

The figures in the margin indicate full marks
for the questions

1. (a) What is invert sugar? Why is it so named? 2
- (b) Write short notes on (i) cellulose nitrate and (ii) amylose. $1\frac{1}{2} + 1\frac{1}{2} = 3$
- (c) What are alkaloids? How are they isolated? 2
- (d) Complete the following reaction sequence : 3



20D/1296

(Turn Over)

OR

2. (a) What is cellulose? What is its main constituent? Give its partial structure in Haworth projection. 3
- (b) Cellulose, having a α -D glucoside units, has a stronger and more compact structure than starch which has β -D glucose units. Explain. 2
- (c) Outline the synthesis of nicotine starting from succinimide. 3
- (d) What is isoprene rule? Illustrate with an example. 2
3. (a) What is vitamin C? Give its structure and biological importance. 3
- (b) Explain a peptide linkage with example. 2
- (c) What is the difference between a nucleotide and a nucleoside? Draw the structure of each one for DNA molecule. 2
- (d) Describe the mechanism of an enzyme-catalyzed reaction. 2

20D/1296

(Continued)

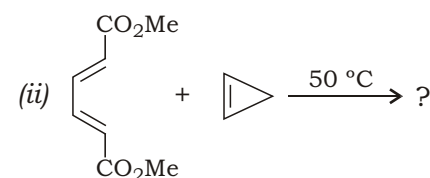
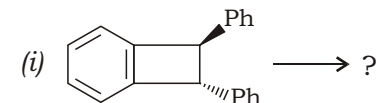
(3)

OR

4. (a) How is an —NH_2 group of an α -amino acid protected during the synthesis of a peptide molecule? Give necessary reactions. 3
- (b) What is the structural difference between the dipeptide Ala-Phe and Phe-Ala? Give their structures. 2
- (c) ATP is also called an 'energy rich molecule'. Explain. 2
- (d) Write the structures showing specific hydrogen bonding between the following pairs of bases : 2
- (i) Thymine and adenine
- (ii) Guanine and cytosine
5. (a) Discuss the different modes of dissipation of energy in a molecule followed by light absorption. $2\frac{1}{2}$
- (b) What is Paterno-Buchi reaction? Describe the mechanism with the stereochemical consequences. $2\frac{1}{2}$
- (c) What are pericyclic reactions? Discuss its various types. 2

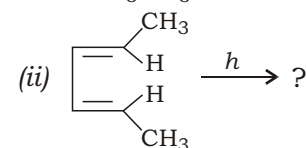
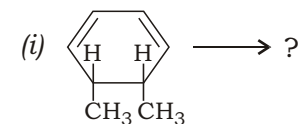
(4)

- (d) Write the products of the following reactions with proper stereochemistry : 2



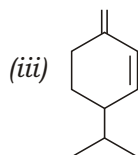
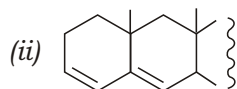
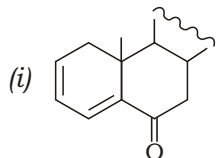
OR

6. (a) Discuss the significance of energy transfer and intersystem crossing in organic photochemical transformations. $2\frac{1}{2}$
- (b) Write a short note on any *one* of the following : 2
- (i) Norrish type-II reaction
- (ii) Photosensitizer
- (c) What are meant by suprafacial and antarafacial modes of cycloaddition? $2\frac{1}{2}$
- (d) Give the products of the following transformations : 2



(5)

7. (a) "Increase in the polarity of the solvent shifts _____ band to longer wavelength but n _____ band to shorter wavelength." Explain the observations. 2
- (b) Toluene is oxidized to benzaldehyde. What changes in ^1H NMR spectral features would you expect for the product with respect to the starting compound? 2
- (c) On the basis of Woodward's rules, calculate the expected position of the absorption maxima in the following molecules : $1 \times 3 = 3$



- (d) The mass spectrum of 1-hexanol gives a base peak at $m/z = 56$. How can one account for this? 2

(6)

OR

8. (a) How can the phenomenon of keto-enol tautomerism in ethyl acetoacetate be detected by IR spectroscopy? 2
- (b) Give reasons for using TMS as the standard in NMR spectroscopy. 2
- (c) How will you differentiate between the following? $1 \frac{1}{2} \times 2 = 3$
- (i) *p*-hydroxyacetophenone and *o*-hydroxyacetophenone (by IR spectroscopy)
- (ii) Buta-1,3-diene and butanone (by UV)
- (d) (i) An organic compound with molecular formula $\text{C}_4\text{H}_9\text{NO}$ gives the following spectral data :
- UV : λ_{max} , 220 m, 63
- IR : 3500 cm^{-1} , 2960 cm^{-1} , 1682 cm^{-1} , 1610 cm^{-1}
- ^1H NMR : 1.0 (6H, doublet), 2.1 (1H, septet), 8.08 (2H, singlet)
- Determine the structure of the compound. 2

(7)

Or

- (ii) An organic compound is found to have a molecular formula $C_9H_{10}O_2$ and gives the following spectral data :

IR : 1740 cm^{-1} , 1220 cm^{-1}

$^1\text{H NMR}$: 7.2 ($5H$, singlet), 5.0 ($2H$, singlet), 1.96 ($3H$, singlet)

Mass spectra : m/z 150 (M^+), 91 , 43 besides other peaks

Determine the structure of the compound.

2

★ ★ ★