

2018

CBCS

1st Semester

CHEMISTRY

PAPER—C1T

(Honours)

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Organic Chemistry-I

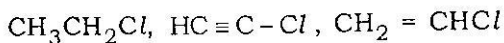
Group-A

1. Answer any *five* questions :

5×2

- (a) Compare with proper justification the stabilities of isobutene, Z-2-butene and E-2-butene.

- (b) Arrange with explanation, the following compounds in order of increasing dipole moments :



- (c) Depict the symmetry elements of the following molecules in terms of σ and C_n .

(i) cis - 1, 2-dimethyl cyclopropane

(ii) Trans-1, 2-dichloroethene

- (d) Give an orbital representation of singlet and triplet carbene

- (e) Write the fishcher projection formula of meso-tartaric acid and represent it in Newman and Sawhorse projection formulae.

- (f) Write the canonical forms of diazomethane

$(\text{CH}_2^- - \text{N}^+ \equiv \text{N})$ and select the most contributing structure.

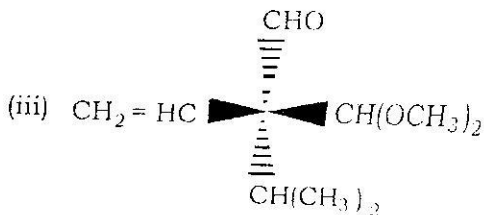
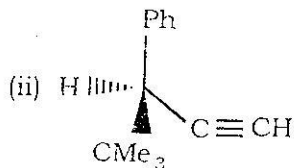
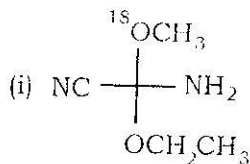
- (g) Calculate the double bond equivalents of (i) C_3H_7N and (ii) $C_7H_6O_2$.
- (i) Draw the Fischer projection formula of L-2-hydroxy propanoic acid and assign R/S configuration to the chiral carbon atom.

Group—B

Answer any four questions :

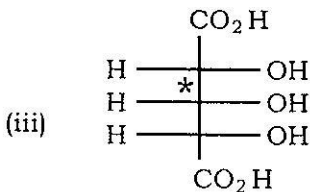
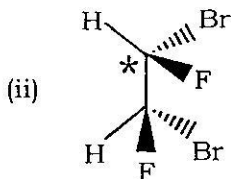
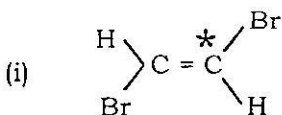
4×5

2. (a) Assign R/S configuration of the following compounds and also show the priority order of the groups : 3



(b) Outline the chemical method of resolution of racemic acid. 2

3. Designate the indicated centres (*) of the following compounds as stereogenic / non-stereogenic and chirotopic / achirotopic. Give reasons

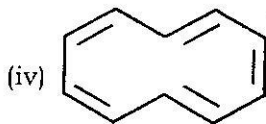
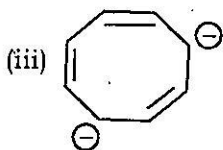
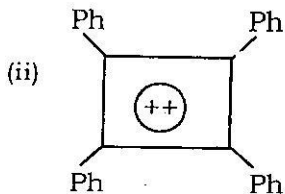
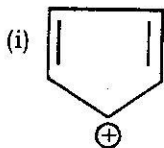


4. (a) What is meant by the terms 'Optical purity' (OP) and 'enantiomeric excess' (ee)? 2

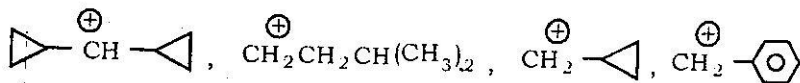
(b) Calculate the ee and the specific rotation of a mixture containing 10g of (+) - 2 - butanol and 6 g of (-) -2-butanol. The specific rotation of enantiomerically pure (+) 2-butanol is +13.5°. 3

5. Draw all the π molecular orbitals of (E)-1, 3-butadiene. Arrange them in order of increasing energy level, designating the HOMO and LUMO in the ground state.
6. Which of the following compounds are aromatic, non-aromatic and antiaromatic?

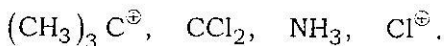
Justify your answer



7. (a) Arrange the following carbocations in order of increasing stability and explain the order 3



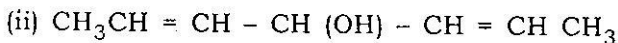
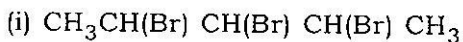
- (b) Classify each of the following species as electrophile and nucleophile and give your reasoning. 2



Group—C

8. Answer any *one* question :

- (a) How many stereoisomers are possible for the following compounds. Are all of them optically active ?



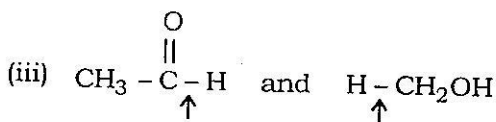
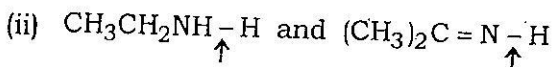
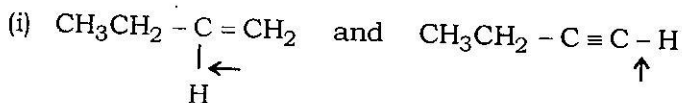
Give Fischer projection formulae of all the stereoisomers. 3+3

- (b) Write down the (2E, 4E)-hepta-2, 4-diene in the s-cis and s-trans conformations. 2

- (c) The ketone (+) $\text{CH}_3\text{CH}_2\text{COCH}(\text{OH})\text{CH}_3$ racemises on treatment with alkali, whereas the isomeric ketone (+) $\text{CH}_3\text{COCH}_2\text{CH}(\text{OH})\text{CH}_3$ does not, Explain. 2

9. (a) Draw orbital picture of carbene in sp^2 -singlet, sp^2 -triplet and sp -triplet states. 3

(b) Which of the indicated bonds in each pair of compounds is shorter and why? 3



(c) Arrange the following compounds in order of increasing boiling point and explain the order. 4

