

January 2023  
M.Sc. - I SEMESTER  
Organic Chemistry (General-I) (CH-102B)

Max. Marks:75

Time: 3 Hours

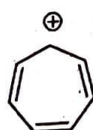
- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
  2. Answer any four questions from Part -B in detail.
  3. Different sub-parts of a question are to be attempted adjacent to each other.

**PART -A**

- Q1 (a) Describe the stability of carbocations on the basis of hyperconjugation. (1.5)
- (b) Explain briefly the Taft equation. (1.5)
- (c) Comment upon the chirality of *trans*-1,2-dibromocyclobutane and *trans*-1,3-dibromocyclobutane. (1.5)
- (d) Draw molecular orbital diagram for HOMO of cyclopentadienyl anion and describe its symmetry w.r.t. mirror plane and  $C_2$ -axis. (1.5)
- (e) Giving suitable examples, differentiate conformation and configuration. (1.5)
- (f) Comment upon the chirality of 6-membered cyclic compounds. (1.5)
- (g) Discuss Felkin Ahn model of chiral synthesis. (1.5)
- (h) What do you understand by anchimeric assistance? (1.5)
- (i) What do you understand by Hammond's postulate. How does it help in determining the reaction mechanism of an organic reaction. (1.5)
- (j) How non-classical carbocations are different from classical carbocations. Explain giving examples. (1.5)

**PART -B**

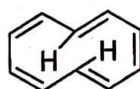
- Q2 (a) Giving suitable evidences in support, explain the mechanism of Von-Richter reaction. (5)
- (b) Differentiate isotope labelling and isotope effect. Discuss their role in determining the mechanism of an organic reaction. (5)
- (c) Assign the following compounds as aromatic/non aromatic/anti-aromatic/homoaromatic giving suitable explanation for each. (5)



(i)



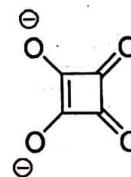
(ii)



(iii)

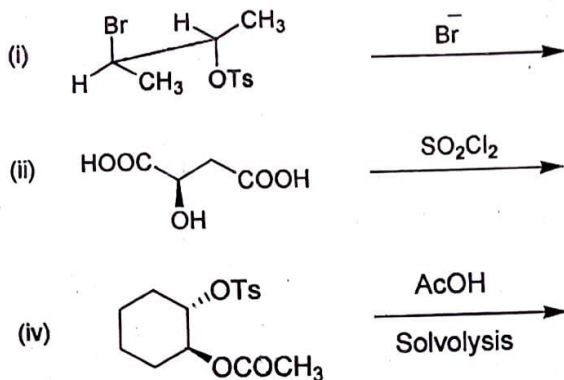


(iv)



(v)

- Q3 (a) Explain the stereochemistry of  $S_N1$ ,  $S_N2$  and ion pair mechanism. (6)
- (b) Complete the following reactions giving suitable mechanism. (9)



Q4 (a) Giving suitable examples, define and explain the following terms; (5)

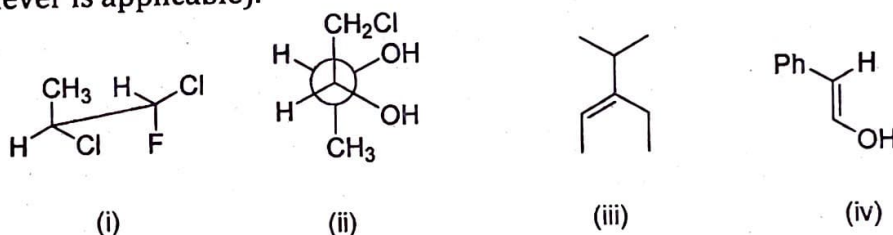
(i) Field Effect

(ii) Cross Conjugation

(b) Hydrolysis of mustard gas ( $\text{Cl-CH}_2\text{CH}_2\text{SCH}_2\text{CH}_2\text{Cl}$ ) with dilute sodium hydroxide solution proceeds thousands of times faster than the corresponding analogous alkyl halide. Explain. (5)

(c) Discuss the various factors affecting stability of carbocations. (5)

Q5 (a) Assign the following structures as Erythro/Threo and E/Z nomenclature (whichever is applicable). (4)



(b) Define the following terms: (4)

(i) Diastereomers

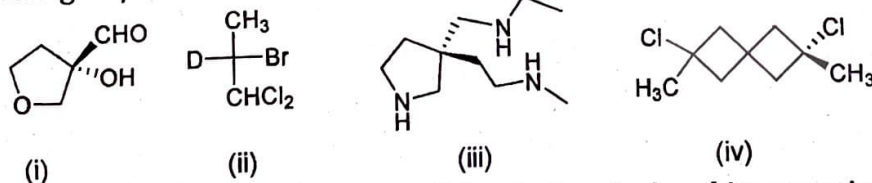
(ii) Anomers

(iii) Chirality

(iv) Chiral axis

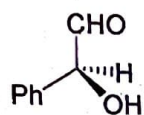
(c) Explain the topicity of ligands and faces giving suitable examples. (7)

Q6 (a) Assign R/S configuration to the following compounds: (6)

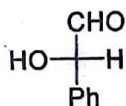


(b) Draw structures of (2R, 3R)-3-Chlorobutan-2-ol and its enantiomer. (3)

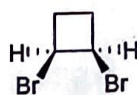
(c) Indicate the following compounds as enantiomers/diastereomers/identical/none. (6)



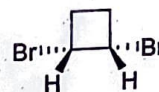
and



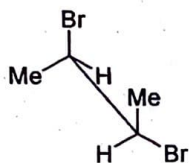
(i)



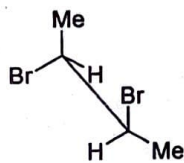
and



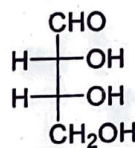
(ii)



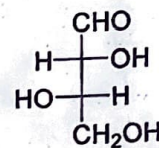
and



(iii)



and



(iv)

- Q7 (a) Explain the various conformations possible for cyclohexane. Also explain their relative stability and draw their energy profile diagram. (7)
- (b) What do you understand by asymmetric synthesis? Explain different strategies employed for asymmetric synthesis giving suitable examples. (8)

\*\*\*\*\*