

**2023**  
**B.A./B.Sc.**  
**Second Semester**  
CORE – 3  
**CHEMISTRY**  
*Course Code: CHC 2.11*  
(Organic Chemistry - I)

*Total Mark: 70*  
*Time: 3 hours*

*Pass Mark: 28*

*Answer five questions, taking one from each unit.*

**UNIT-I**

1. (a) What is hybridization? What are the distinguishing features of  $sp^3$  and  $sp^2$  orbitals? Explain with examples. 1+3=4  
(b) Explain briefly how a carbonium ion, carbanion ion, and free radical are obtained. 3  
(c) What is mesomeric effect? Give an example of a system where this effect is operative. 3  
(d) Differentiate between electrophilic substitution and nucleophilic substitution reaction. 4
  
2. (a) Write the chemical formula for the compound having IUPAC name as: 1×2=2  
(i) 4-Methylpent-2-ene  
(ii) 2-Chlorobutanedioic acid  
(b) What is nucleophilicity? Arrange the following halide ions in terms of decreasing nucleophilicity in aqueous medium:  
 $F^-$ ,  $Cl^-$ ,  $Br^-$ ,  $I^-$  3  
(c) Write note on the following: 2×3=6  
(i) Hyperconjugation  
(ii) Dipole moment  
(iii) Carbenes  
(d) Explain why ethyl carbocation is more stable than methyl carbocation. 3

## UNIT-II

3. (a) Define conformation. Draw the potential energy diagram of butane and predict the most stable conformer. 1+4=5
- (b) What is geometrical isomerism? Draw the E and Z isomer of the compound  $\text{BrIC}=\text{CFCl}$ . 3
- (c) What is resolution? How will you resolve a racemic mixture by chemical method? 3
- (d) Explain Fischer's projection with suitable example. 3
4. (a) Write note on the following: 2×2=4
- (i) Optical activity
- (ii) Specific rotation
- (b) Discuss the relative (D and L) configuration with an example. 3
- (c) Predict whether 3-chlorohexane will be optically active or not? Give reason. 3
- (d) Differentiate between enantiomerism and diastereoisomerism with example. 4

## UNIT-III

5. (a) What is Wurtz-Fittig reaction? Give the chemical reaction. 3
- (b) Write the reaction with mechanism of hydroboration-oxidation reaction. 3
- (c) Explain the following statements: 2×2=4
- (i) A branched chain hydrocarbon boils at lower temperature than a straight chain isomer.
- (ii) More highly alkylated alkenes are more stable.
- (d) Explain the allylic bromination reaction with mechanism using NBS. 4
6. (a) Explain Saytzeff's rule with an example. 3
- (b) Giving chemical equation, explain what happens when: 2×2=4
- (i) 1, 3-butadiene is treated with bromine in a polar solvent
- (ii) Propanol is heated with conc.  $\text{H}_2\text{SO}_4$  at  $170^\circ\text{C}$
- (c) Describe the mechanism of addition of  $\text{HBr}$  to propene in presence of an organic peroxide. 4
- (d) Using a suitable example, explain Diel's Alder reaction with mechanism. 3

## UNIT-IV

7. (a) Give a brief explanation on the acidity of terminal alkynes. 3  
(b) Predict the products of the following reactions: 2×2=4  
(i)  $\text{CH} \equiv \text{CH} + \text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{KOH}}$   
(ii)  $\text{CH}_3 - \text{C} \equiv \text{CH} + \text{H}_2\text{O} \xrightarrow{\text{H}_2\text{SO}_4/\text{HgSO}_4}$   
(c) There is no strain in either chair or boat form in cyclohexane. Why then the chair conformation is more stable than the boat conformation? 3  
(d) Justify with example why acetylene undergoes electrophilic as well as nucleophilic addition reactions? 4
8. (a) Discuss the relative stability of chair, boat and twist conformers of cyclohexane with energy diagram. 4  
(b) How will you bring about the following conversions? 2×2=4  
(i) Acetylene into oxalic acid (ii) Propyne into dibromopropane  
(c) What is the reason for the low reactivity of alkynes towards electrophilic addition? 3  
(d) What are cycloalkanes? Give the different types of cycloalkanes. 3

## UNIT-V

9. (a) Why is  $-\text{NO}_2$  group meta-orienting while  $-\text{NH}_2$  group is ortho and para-orienting? 3  
(b) Explain with mechanism the nitration of benzene. 4  
(c) What is Huckel's rule for aromaticity? Give one example each of both aromatic and non-aromatic compounds based on Huckel's rule. 3  
(d) Explain with example why aromatic compounds undergo substitution reactions much easily than addition reactions? 4
10. (a) Halogens are electron withdrawing in nature but they are ortho and para directing in benzene. Explain. 3  
(b) Describe the Friedel-Crafts acylation with mechanism. 4  
(c) Out of toluene and nitro benzene, which will be nitrated more easily and why? 3  
(d) Give the mechanism of halogenations of benzene. 4