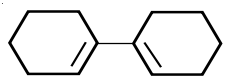
2024
B.A./B.Sc.
Sixth Semester
CORE – 14
CHEMISTRY
Course Code: CHC 6.21
(Organic Chemistry - V)

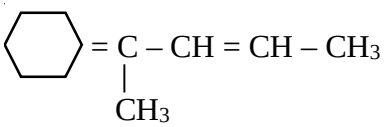
Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

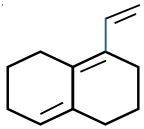
Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Write short notes on the following: 2×2=4
   (i) Chromophores
   (ii) Auxochromes
   (b) Calculate the absorption maximum (λ_{max}) of the following compounds based on Woodward's rule. 2×3=6

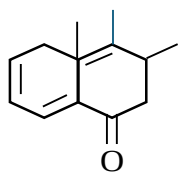
(i) 

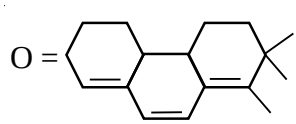
(ii) 

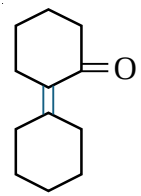
(iii) 

   (c) Explain the infrared spectroscopy with respect to molecular vibration. 4

2. (a) Calculate the absorption maximum (λ_{max}) of the following compounds based on Woodward's rule. 2×3=6

(i) 

(ii) 

(iii) 

(b) The force constant for carbon monoxide molecule is 1840 Nm^{-1}. Calculate the vibrational frequency (in cm^{-1}). Given that atomic masses are: 3
$^{12}C = 19.9\times10^{-27}$ kg, $^{16}O = 26.6\times10^{-27}$ kg.

(c) Discuss the finger print region in infrared spectroscopy. 5

UNIT–II

3. (a) Define anisotropic effect. Discuss the anisotropic effect on the following: 1+2×3=7
   (i) Alkenes
   (ii) Alkynes
   (iii) Aromatic compounds

   (b) Write a note on spin-spin coupling. 3

   (c) What are the factors that influence chemical shift? Briefly elaborate any two factors. 4

4. (a) How many kinds of NMR signals would you expect from the following compounds? 1×4=4
   (i) $CH_3 - CH_2 - CH_3$
   (ii) $CH_2 = CH_2$
   (iii) $CH_3 - CH = CH_3$
   (iv) $C_6H_5 - CH_3$

   (b) A compound has a molecular formula $C_{10}H_{13}Cl$. Assign its structure with the help of the following data

   Singlet 1.57 δ 6H
   Singlet 3.07 δ 2H
   Singlet 7.27 δ 5H 3

(c) Two isomeric compounds *A* and *B* have molecular formula $C_2H_4Cl_2$. Compound *A* gives one NMR signal as a singlet at $\delta = 3.7$ whereas *B* gives two signals, a doublet at $\delta = 2.1$ and a quartet at $\delta = 5.8$. Assign the structure to compound *A* and *B*. 4

(d) Explain shielding and deshielding of protons. 3

UNIT–III

5. (a) Differentiate between aldohexoses and aldopentose. 3

(b) Define anomers and epimers with suitable examples. 3

(c) Give the structure elucidation of maltose. 4

(d) What are polysaccharide? Write a note on cellulose. 4

6. (a) What do you understand by α- and β-glycosidic linkage? 3

(b) With chemical reactions, explain what happens when 2+2=4

(i) sucrose is hydrolysed with dilute acids.

(ii) fructose is heated with conc. hydrochloric acid.

(c) Describe Ruff's degradation of an aldohexose to aldopentose. 4

(d) Give the evidence in support of the pyranose ring structure of glucose. 3

UNIT–IV

7. (a) Give the classification of dyes based on their application. 4

(b) Write the synthesis and uses of the following dyes: 3×2=6

(i) Malachite green

(ii) Congo red

(c) Briefly outline the structure elucidation of indigotin. 4

8. (a) Discuss the electronic concept of colour and constitution. 3

(b) What are natural dyes? Give the synthesis of indigo. 4

(c) Differentiate between mordant dye and vat dyes. 3

(d) Give the synthesis and uses of fluorescein dye. 4

UNIT–V

9. (a) What are biodegradable polymers? Give example. 2

(b) Discuss the Ziegler-Natta polymerization of alkene. What are their advantages over free radical polymerization? 3+2=5

(c) Give the preparation of the following with chemical reaction: 2×2=4

(i) Phenol-formaldehyde resin

(ii) Chloroprene

(d) Write the mechanism for cationic polymerization reaction. 3

10. (a) What is natural rubber? Give its chemical formula. What is the significance of vulcanization of natural rubber? 1+1+2=4

(b) Give the preparation of the following with chemical reaction: 2×2=4

(i) Polyester

(ii) PVC

(c) Write a note on polydispersity index. 2

(d) Equal number of molecules with M_1 = 10,000 and M_2= 100,000 are mixed. Calculate weight average and number average molecular mass. 4