Total No. of Printed Pages—7

6 SEM TDC CHMH (CBCS) C 14

2025

(May)

CHEMISTRY

(Core)

Paper : C–14

(Organic Chemistry)

Full Marks : 53

Pass Marks : 21

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer from the following : 1×5=5

(a) Natural rubber is a polymer of

(i) 2-methyl-1, 3-butadiene

(ii) 2-chloro-1, 3-butadiene

(iii) 2-methyl but-2-ene

(iv) 1, 3-butadiene

(b) The different types of energies associated with a molecule are

(i) electronic energy

(ii) vibrational energy

(iii) rotational energy

(iv) All of the above

(c) Among the following the NMR active nucleus is

(i) ^{12}C

(ii) ^{19}F

(iii) ^{2}H

(iv) ^{16}O

(d) Which of the following is a basic dye?

(i) Congo red

(ii) Aniline yellow

(iii) Alizarin

(iv) Indigo

(e) Which of the following is the general formula of carbohydrates?

(i) $(C_4H_2O)_n$

(ii) $(C_6H_2O)_n$

(iii) $(CH_2O)_n$

(iv) $(C_2H_2O)_nCOOH$

UNIT—I

2. Answer the following questions (any *five*) : 2×5=10

(a) Polar solvent shift $\pi \rightarrow \pi^*$ transition to higher wavelength. Explain.

(b) The nuclei of ^{12}C is NMR inactive but ^{13}C is NMR active. Explain.

(c) Conjugate diene has higher λ_{max} than isolated diene. Explain.

(d) Chemical shift depend upon applied magnetic field but spin spin coupling N coupling constant is independent of the applied magnetic field. Explain.

(e) How can you study H-bonding using IR spectroscopy?

(f) What do you mean by fundamental band and overtone band?

3. CH_3OH is good solvent for UV spectroscopy but bad solvent for IR spectroscopy. Explain. 3

4. Answer the following questions (any *two*) : $4\times2=8$

(a) The mass spectrum of an organic compound shows an abundant molecular ion peak at $\frac{m}{2}=72$. The compound gives a characteristic band at 275 nm ($\lambda_{max}=17$) in its UV spectrum. The IR spectrum shows prominent peak at $2940\ cm^{-1}$, $2855\ cm^{-1}$ and $1715\ cm^{-1}$, PMR spectrum of the compound is as follows :

$\delta 2\cdot5(q, 2H)$, $\delta 2\cdot12(s, 3H)$ and $\delta 1\cdot07(t, 3H)$

Determine the structure of the compound and explain the peaks.

(b) Three isomeric dienes *A*, *B* and *C* with molecular formula C_5H_8 shows λ_{max} 178, 211 and 215 nm. All the dienes or hydrogenation yield *n*-pentane. What are the possible structure of *A*, *B* and *C*? Given that λ_{max} of pent-1-ene is 176 nm. Justify your answer.

(c) (i) NMR signal of ethylenic proton is observed at higher δ value than acetylenic proton. Explain. 2

(ii) What do you mean by finger print region? 2

UNIT—II

5. Answer the following questions (any *three*) : 2×3=6

(a) How will you show that D glucose is reducing sugar?

(b) Sketch the stable conformer of the anomer of α-D-glucopyranose.

(c) How do you establish that configuration at C_3, C_4 and C_5 of D-glucose and D-mannose are same?

(d) Convert D-glucose to epimeric aldohexose.

6. Assign the structures (*A*) to (*C*) from the following reaction : 3

$$\text{Aldohexose} \xrightarrow{NH_2OH} A \xrightarrow[AcOH]{Ac_2O} B \xrightarrow{AgOH} \underset{(C)}{C_5H_{10}O_5} + AgOH + CH_3COOAg$$

Or

What product do you expect when methyl-D-(+)-glucopyranoside is subsequently subjected to periodic oxidation, Br_2—H_2O oxidation, strontium salt formation and hydrolysis with dil HCl.

UNIT—III

7. Answer the following questions (any *three*) : 2×3=6

(a) What are requisites for a compound to be true dye?

(b) Write one method for the synthesis of indigo.

(c) Discuss briefly the Witt's theory for colour and constitution.

(d) Explain the following terms with suitable example : 1+1=2

(i) Hypsochromic shift

(ii) Auxochrome

8. Write one synthesis each of the following (any *two*) : 1½×2=3

(a) Fluorescein

(b) Methyl orange

(c) Phenolphthalein

UNIT—IV

9. What is vulcanization of rubber? How does it affect the quality of the polymer? 1½+1½=3

Or

Write a short note on phenol-formaldehyde resin. 3

10. Answer the following questions : $2 \times 3 = 6$

(a) Write down the structure of the polymer-polyurethane and nylon-6. $1+1=2$

(b) Write the difference between addition and condensation polymerization.

(c) Write a short note on biodegradable polymer.

★ ★ ★