TDC (CBCS) Even Semester Exam., 2024

CHEMISTRY

(6th Semester)

Course No. : CHMHCC-602T

(Organic Chemistry—V)

Full Marks : 50
Pass Marks : 20

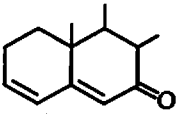
Time : 3 hours

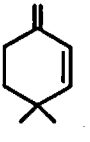
The figures in the margin indicate full marks for the questions

UNIT—1

1. Answer any *two* questions from the following : 2×2=4

(a) Calculate λ_{max} for the following compounds :





(b) Explain why *cis*-stilbene absorbs at shorter wavelength than *trans*-stilbene.

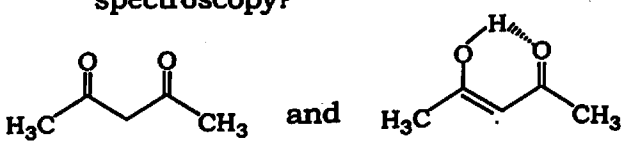
(c) What is fingerprint region? What is its significance?

2. Answer any *one* question from the following : 6

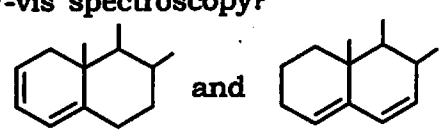
(a) (i) In a more polar solvent $n \rightarrow \pi^*$ transitions show a blue shift but $\pi \rightarrow \pi^*$ transitions show a red shift. Explain. 2

(ii) Between cyclopentanone and cyclohexanone, which one will exhibit higher $\gamma_{C=O}$ stretching values? Justify your answer. 2

(iii) How will you distinguish the following tautomers by IR spectroscopy? 2



(b) (i) How will you distinguish the following pair of compounds by UV-vis spectroscopy? 2



(ii) Inter- and intra-molecular H-bonds can be distinguished by IR spectroscopy. Explain with suitable example. 2

(iii) $\gamma_{C=C}$ (stretching) for but-1-ene and but-1,3-diene are 1650 cm^{-1} and 1610 cm^{-1} respectively. Explain. 2

UNIT—2

3. Answer any *two* questions from the following : 2×2=4

(a) Why is TMS used as an internal standard in NMR spectroscopy?

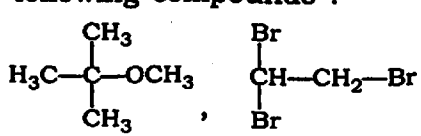
(b) Which of the following atoms do not exhibit nuclear magnetic resonance? Justify your answer.

^{12}C, ^{16}O, ^{19}F, ^{31}P

(c) Both CH_3COCH_3 and CH_3CH_2CHO have molecular formula C_3H_6O. How will you distinguish them by ^1H NMR spectroscopy?

4. Answer any *one* question from the following : 6

(a) (i) What do you mean by chemical shift in NMR spectroscopy? Comment on the number of signals and splitting pattern in any one of the following compounds : 1+2=3



(ii) A compound with molecular formula $C_7H_5OCl_3$ shows a three-proton singlet at δ3·9 and two one-proton doublets ($J = 8$ Hz) at δ6·76 and δ7·3. Identify the compound. 3

(b) (i) Sketch the expected ^1H NMR spectra indicating probable values of chemical shift, splitting pattern and relative intensities for the compound, CH_3CH_2Cl. 3

(ii) What are shielding and deshielding effects in NMR spectroscopy? Explain why NMR spectrum of benzene is observed at a lower field whereas that of acetylene is observed at higher field. 1+2=3

UNIT—3

5. Answer any *two* questions from the following : 2×2=4

(a) What are the limitations of open-chain structure of glucose?

(b) What are anomers? Draw the structures of anomers of D-glucose.

(c) How will you distinguish chemically glucose from fructose?

6. Answer any *one* question from the following : 6

(a) (i) Explain why D-glucose and D-fructose form the same osazone. 3

(ii) What happens when—

(1) D-glucose undergoes fermentation by the enzyme zymase in yeast;

(2) D-glucose reacts with HI and red P;

(3) D-fructose reacts with hydroxyl amine? 3

(b) (i) Explain why sucrose is also called invert sugar. 2

(ii) Convert the following : 2×2=4

(1) D-arabinose to D-glucose

(2) D-glucose to D-mannose

UNIT—4

7. Answer any *two* questions from the following : 2×2=4

(a) What are vat dyes? Explain with example.

(b) What are chromophores and auxochromes? Explain with examples.

(c) What are the requirements of a coloured compound to act as a dye?

8. Answer any *one* question from the following : 6

(a) *(i)* Give the preparation of phenolphthalein. Explain the colour change on the basis of quinonoid theory. 2+2=4

(ii) Discuss briefly the modern theories of colour and chemical constitution. 2

(b) *(i)* What are azo dyes? Give the preparation of methyl orange. Explain why methyl orange is used as indicator in acid base titration. 1+1+2=4

(ii) How are dye classified? Give an example of each class of dyes. 2

UNIT—5

9. Answer any *two* questions from the following : 2×2=4

(a) How do thermoplastic polymers differ from thermosetting polymers? Give two examples of each type.

(b) How will you synthesis Nylon-6,6 from 1,3-butadiene?

(c) What are homopolymers and co-polymers? Give examples of each type.

10. Answer any *one* question from the following : 6

(a) *(i)* What is polymerization reaction? Discuss free radical polymerization reaction by taking suitable example. 1+2=3

(ii) What are synthetic rubbers? How can Buna-S rubbers be synthesized? Give applications of Buna-S rubber. 3

(b) *(i)* What are high-density polyethylene? How can HDPE be synthesized using Ziegler-Natta catalyst? What are the uses of HDPE? 1+2+1=4

(ii) What are polyesters? What are the monomers of poly(ethylene-terephthalate)? 2

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