Total No. of Printed Pages—8

6 SEM TDC CHMH (CBCS) C 14

2022

(June/July)

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

(a) When the λ_{max} of a compound shifts to a shorter wavelength on certain treatment, the compound is said to have undergone

(i) bathochromic shift

(ii) hypochromic effect

(iii) hyperchromic shift

(iv) hypsochromic shift

(b) Dyes which can be applied directly to cotton from water solution are called

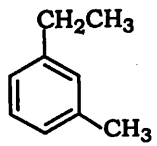
(i) mordant dyes

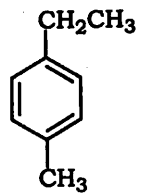
(ii) vat dyes

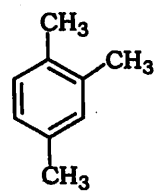
(iii) sustentive dyes

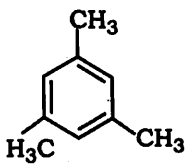
(iv) dispersive dyes

(c) The NMR spectrum of the compound C_9H_{12} shows two signals at $\tau 3 \cdot 22$(s, 3H) and $7 \cdot 75$(s, 9H). Which of the following structures is in conformity with the data?

(i) 

(ii) 

(iii) 

(iv) 

(d) The monomers of Buna-S rubber are

(i) isoprene and butadiene

(ii) styrene and butadiene

(iii) adipic acid and hexamethylene diamine

(iv) chloroprene

(e) Epimeric carbohydrates differ in their

(i) configuration at α-C atom

(ii) number of —OH groups

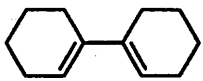
(iii) ring size

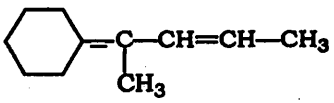
(iv) None of the above

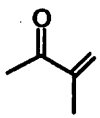
UNIT—I

2. Answer the following questions :

(a) Calculate λ_{max} in UV spectrum for the following : 1×3=3

(i) 

(ii) 

(iii) 

(b) Account for the following observations : 2×2=4

(i) Ethylene is colourless, but a polyene, e.g., $CH_3(CH{=}CH)_6CH_3$ is yellow.

(ii) 1,4-pentadiene does not absorb light above 200 nm.

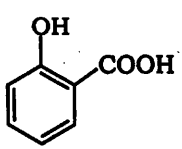
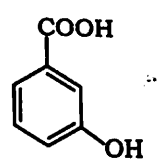
(c) Pent-1-ene absorbs at 176 nm. The absorption data, λ_{max} for three isomeric dienes *A*, *B* and *C* of molecular formula C_5H_8 is 178 nm, 211 nm and 215 nm respectively. Write down the structures of *A*, *B* and *C* with proper reasoning. 2

Or

Using MO theory, account for the following trends in λ_{max} (nm) :

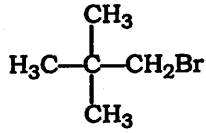
Ethylene (175), 1,3-butadiene (217) and 1,3,5,-hexatriene (250)

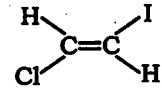
(d) How will you differentiate between the following pairs of compounds using IR spectra? 1½×2=3

(i)  and 

(ii) CH_3CH_2CHO and $H_2C{=}\underset{H}{C}{-}CH_2OH$

(e) What will be the multiplicity of each kind of proton in the following molecules? 2

(i) 

(ii) 

(f) A compound, $C_9H_{10}O_2$, shows the following signals in ^{1}HNMR spectrum :

(i) $\delta 2 \cdot 3$ (3*H*, singlet)

(ii) $\delta 3 \cdot 6$ (3*H*, singlet)

(iii) $\delta 6 \cdot 4 - 7 \cdot 5$ (4*H*, a pair of doublets $J = 8$ Hz)

Assign a structure to the compound. 3

(g) Identify the compound by analyzing the following data : 2

IR $\nu(cm^{-1})$: 1600, 1715, 3000

Mass (*m*/*e*) : 43, 91, 134 (M^+)

NMR δ value : $2 \cdot 1$ (s, 3*H*), $3 \cdot 6$ (s, 2*H*), $7 \cdot 3$ (*m*, 5*H*)

(h) Explain the effect of polar solvent on π-π^* and *n*-π^* transitions. 2

Or

Why is TMS used as a reference in NMR spectroscopy?

UNIT—II

3. Answer the following questions :

(a) Establish the cyclic structure of D-glucose. 2

Or

Explain why D-glucose and D-fructose give the same osazone.

(b) What is epimerization? Explain it considering the conversion of D-glucose to D-mannose. 1+2=3

(c) Why does the anomeric —OH group undergo methylation with CH_3OH and HCl under reflux but others do not? 2

(d) Complete the following reaction : 3

$$\text{D-glucose} \xrightarrow{3PhNHNH_2} \text{Osazone} \xrightarrow{\text{dil. HCl}} \text{Osone} \xrightarrow{Zn/AcOH} \text{a ketohexose}$$

UNIT—III

4. Answer any *four* of the following questions : 2×4=8

(a) What are the requirements of a substance to act as a dye? Name two substances which meet these requirements.

(b) How will you synthesize fluorescein?

(c) How would you prepare Congo red from naphthionic acid? Discuss its use as acid-base indicator.

(d) What are the chromophores and auxochromes present in the following dyes?

(i) Alizarin

(ii) Methyl orange

(e) Give one example of a xanthene dye and mordant azo dye. Also write their structures.

UNIT—IV

5. Answer the following questions :

(a) What is Ziegler-Natta catalyst? Discuss their importance in the formation of addition polymer. 2

(b) What type of alkenes prefer to undergo cationic polymerization? Discuss the role of electron donating groups in cationic polymerization. 1+2=3

Or

Discuss the mechanism of a peroxide-initiated chain growth polymerization involving any vinyl monomer. 3

(c) What do you understand by the term 'biodegradable polymers'? Give two examples. 1+1=2

(d) How would you prepare the following (any *one*)? 2

(i) Neoprene

(ii) Nylon-6

★★★