Total number of printed pages–12

3 (Sem–6/CBCS) CHE HC 2

2022

CHEMISTRY

(Honours)

Paper : CHE–HC–6026

(Organic Chemistry–V)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions : ***(any seven)*** 1×7=7

   (a) Give an example of edible dye.

   (b) Which one of the following is most reactive for anionic polymerization ?

   (i) $CH_2 = CH - NO_2$

   (ii) $CH_2 = CH - CH_3$

Contd.

(iii) $CH_2 = CH - C_6H_5$

(iv) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = CH_2$

(c) Which of the following is laevorotatory ?

(i) Glucose

(ii) Fructose

(iii) Sucrose

(iv) Cellulose

(d) Fill in the blank :

The auxochrome group in the picric acid is _____.

(e) The electronic transition, which requires maximum energy is

(i) $\sigma - \sigma^*$

(ii) $\pi \rightarrow \pi^*$

(iii) $n \rightarrow \pi^*$

(iv) $n \rightarrow \sigma^*$

(f) Which of the following compounds absorb UV radiation ?

(i) Heptane

(ii) Benzene

(iii) Butadiene

(iv) Acetone

(g) Which of the following compounds does not show mutarotation ?

(i) Glucose

(ii) Fructose

(iii) Maltose

(iv) Sucrose

(h) How many stereoisomers should an aldohexose have ?

(i) Ribose and xylose are

(i) epimers

(ii) anomers

(iii) disaccharide

(iv) optically inactive

(j) What are the constituents of starch ?

2. Give answer of the following : ***(any four)*** 2×4=8

(a) Write the expected products by showing the reaction of hydrolysis of lactose.

(b) Glucosides neither give positive test with Fehling solution or Tollen's reagent nor undergo mutarotation. Explain.

(c) Indicate the mechanism, cationic, anionic or free radical—by which the following monomers will undergo polymerization :

(i) $CH_2 = C\begin{matrix}CH_3\\CH_3\end{matrix}$

(ii) $CF_2 = CF_2$

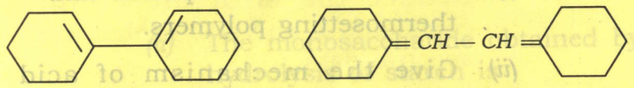
(iii) $CH_2 = CH - OCOCH_3$

(iv) $CH_2 = C\begin{matrix}CN\\CN\end{matrix}$

(d) Give the method of preparation and uses of PVC and neoprene.

(e) How do you explain the greater stability β-*D*(+)-glucopyranose ?

(f) Why is the λ_{max} for the diene (I) low than diene (II).



(I) (II)

(g) "Though azobenzene is a coloured compound it is not used as a dye." Explain why.

(h) Fill in the blanks :

(i) Amylose is a _____ polymer of _____ .

(ii) Amylopectin is a _____ polymer of _____ .

3. Answer ***any three*** of the following : 5×3=15

(a) *(i)* Draw the cyclic anomeric forms of *D*-fructose.

(ii) Give the mechanism for hydrolysis of glycoside under acidic condition. 1+4=5

(b) Explain the following : 2½×2=5

(i) Chemical shift

(ii) Spin-spin coupling

(c) (i) Differentiate thermoplastic and thermosetting polymers.

(ii) Give the mechanism of acid catalyzed formation of phenol-formaldehyde resin.

2½×2=5

(d) How many proton signals would be expected in NMR spectra of each of the following compounds ? 2½×2=5

(i) $ClCH_2CH_2CH_2OH$

(ii) $CH_3-O-CH_2-CH_3$

(e) Differentiate the following by giving *one* example of each :

2½×2=5

(i) Reducing sugar and non-reducing sugar

(ii) Sugar and non-sugar

(f) Find out the correct answer of the following : 1×5=5

(i) Glucose cannot be clarified as
(hexose, an oligosaccharide, an aldose, a monosaccharide)

(ii) The monosaccharide obtained by hydrolysis of starch is
(*D*-glucose, maltose, *D*-galactose, *D*-ribose)

(iii) The product which is not derived from cellulose is
(rayon, insulin, gun cotton, paper)

(iv) Carbohydrates are stored in the body as
(sugars, starch, glucose, glycogen)

(v) Hydrolytic conversion of sucrose into glucose and fructose is called
(induction, insertion, inversion, inhibition)

(g) (i) A very strong characteristic absorption for – *C*= *C*– stretching vibration is observed for *cis-2-butene* but not for *trans-2-butene*. Explain briefly. 2

(ii) A compound *A* having molecular formula C_3H_6O gave the following IR spectral data :

$2720cm^{-1}$ and $2820cm^{-1}$ (doublet) and $1730cm^{-1}$ (singlet).

Deduce the structure of the compound *A* and also explain the spectral data. 3

(h) (i) What is a leuco base ? How can it be converted into a dye ?

(ii) How will you synthesize alizarin from anthraquinone ?

2½×2=5

4. Answer ***any three*** of the following : 10×3=30

(a) (i) What is Ziegler-Natta polymerization ? Discuss its special importance in the synthesis of addition polymers. 1+4=5

(ii) What is Nylon-66 ? 2

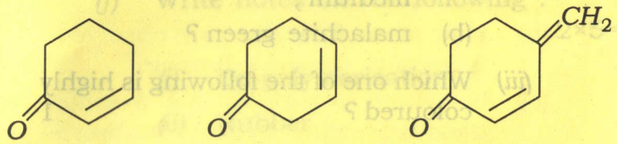
(iii) Write the structures of monomer unit for the following polymers : 3

Polyvinyl chloride, Teflon and Rubber

(b) (i) A pleasant smelling liquid having molecular formula $C_9H_{10}O_2$ shows three singlets in the NMR spectrophotometry at δ 7·31 (5*H*), 5·08 (2*H*) and 2·06 (3*H*) and an IR peak at $1730cm^{-1}$ but none near $3350cm^{-1}$. Identify the compound. 5

(ii) What kind of transition of the compound CH_3OCH_3 gives rise to the 185*nm* absorption ? 1

(iii) Which one of the following would be expected to absorb light of longest and shortest wavelength and why ? 4



Str.(*A*) *Str.*(*B*) *Str.*(*C*)

(c) (i) Explain the following : 2×2=4

(a) *H*–bonding raises the wavelength of absorption.

(b) –1 effect raises the wave number of absorption.

(ii) How will you distinguish the following by spectroscopy? 3×2=6

(A) Salicyclic acid and *p*-hydroxy-benzoic acid (by IR).

(B) $ClCH_2CH_2Cl$ and CH_3CHCl_2 (by ^1H NMR)

(d) (i) Give the structural formula of the following : 2×3=6

(a) Fluorescein

(b) Congo red

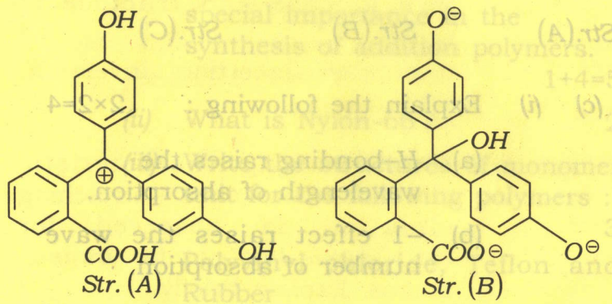
(c) Methyl Orange

(ii) What Chromophore is group present in— 1×2=2

(a) fluoroscein in alkaline medium ;

(b) malachite green ?

(iii) Which one of the following is highly coloured ? 1



(iv) What is Witt's theory of colour and constitution of dye ? 1

(e) (i) Give the concept of poly-dispersion in polymers. 2

(ii) How will you synthesize polystyrene from benzene ? 3

(iii) State the differences between addition and condensation polymerization. 3

(iv) Give reasons why PVC is soft and flexible whereas bakelite is hard and brittle. 2

(f) Write notes on the following : 2×5=10

(i) Co-polymerisation

(ii) Rubber

(iii) Configuration of polymer chains

(iv) Polymer classification

(v) Electrically conducting polymers

(g) (i) Explain why the polysaccharide do not mutarotate. 2

(ii) Give the structures of sucrose, lactose and maltose. 3

(iii) Fill in the blanks : 1×5=5

(A) *D*-glucose is an epimer of _____.

(B) Ketoses have less number of _____ than aldoses.

(C) Mild oxidation of glucose gives _____.

(D) _____ is present mostly as furanose.

(E) The common form of glucose as represented by Haworth projection is known as _____.

(h) (a) Why is ESR spectrum recorded in derivative mode ? 1

(b) How many ESR lines are observed in methyl radical ? Explain. 2

(c) In which region of the δ-scale usually aromatic hydrogens absorb in a ^{1}H NMR spectrum and why ? 3

(d) How would you expect the ^{1}H NMR spectrum of ethanol to vary when it is recorded as—

(i) pure ethanol ;

(ii) ethanol in presence of small amount of water ? 4