3 (Sem–6/CBCS) CHE HC 2

2024

CHEMISTRY

(Honours Core)

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 : 1×7=7

    (a) Give an example of triphenylmethane dye.

    (b) Write the name of the five-membered cyclic hemeacetal form of D-ribose.

    (c) Draw the structure of the product obtained from sodium borohydride reduction of D-glucose.

    (d) In which region NMR spectra are observed ?

(e) Which of the following statements is false about glucose ?

    (i)   It is a reducing sugar.

    (ii) It is a disaccharide.

    (iii) It has a pyranose structure.

    (iv) It is a polyalcohol.

(f) Fill up the blank :

Two monosaccharides are joined through a ____ bond to form a disaccharide.

(g) Mention the configuration of natural rubber.

2. Give answer of the following : $2 \times 4 = 8$

(a) Draw the Fisher projection diagram of the tetroses.

(b) Name the monomer units of Buna-S-rubber.

(c) (i)   Between nitrobenzene and nitrophenol which one is more intensely coloured ?

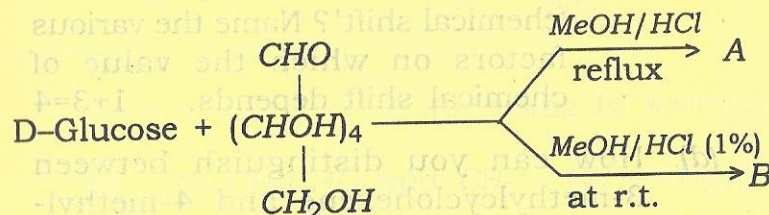   (ii) What are the commonly encountered transitions in UV spectroscopy ?

(d) Fill up the blanks :

Starch contains about 20% of a water-soluble fraction called ____ and 80% of water-insoluble fraction called ____.

3. Answer *any three* of the following :

                        $5 \times 3 = 15$

(a) (i) Find out A and B in the following reaction :   2

$$\text{D–Glucose} + (CHOH)_4 \begin{cases} \xrightarrow[\text{reflux}]{MeOH/HCl} A \\ \xrightarrow[\text{at r.t.}]{MeOH/HCl\ (1\%)} B \end{cases}$$

with CHO and CH_2OH groups.

    (ii) Write the synthesis of methyl orange.   3

(b) Write true **or** false for the following statements : $1 \times 5 = 5$

    (i)   Fructose exists as both pyranose and furanose structures.

    (ii) The simplest carbohydrate is glyceraldehyde.

(iii) Galactose is not a disaccharide.

(iv) Hydrolysis of starch with dil.H_2SO_4 at 393K under pressure gives glucose.

(v) Glucose is also known as dextrose.

(c) *(i)* Fill up the blank :   1

No two compounds except the ____ can have similar IR-spectra.

(ii) What do you mean by the term 'chemical shift'? Name the various factors on which the value of chemical shift depends.   1+3=4

(d) How can you distinguish between 3-methylcyclohexene and 4-methyl-cyclohexene on the basis of mass spectroscopy?

(e) Write short notes on : *(any two)*

$2\frac{1}{2} \times 2 = 5$
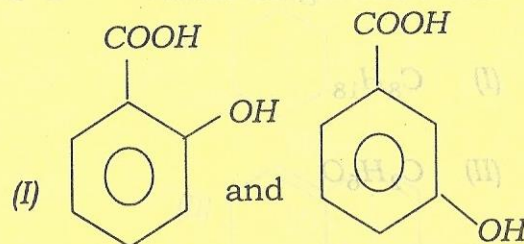
(i) Zeigler-Natta polymerisation

(ii) Amylose

(iii) Volcanization of rubber

(iv) Degree of polymerisation

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4. Answer **any three** of the following : 10×3=30
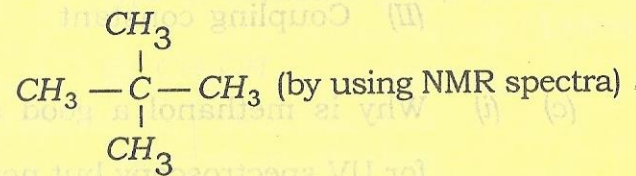
(a) *(i)* Define absorbance.   1

*(ii)* How will you differentiate between the following pairs of compounds ?

3×3=9

(I)

COOH   COOH

OH

and

OH

(by using IR spectra)

(II) CH_3CH_2CHO and $CH_2 {=} CH {-} CH_2OH$

(by using IR spectra)

(III) $CH_3 {-} CH_2 {-} CH_2 {-} CH_3$ and

$$CH_3 {-} \underset{\underset{\displaystyle CH_3}{|}}{\overset{\overset{\displaystyle CH_3}{|}}{C}} {-} CH_3 \text{ (by using NMR spectra)}$$

(b) (i) Predict the structural formula for the compounds with the following molecular formulas showing only one PMR signal each : 2×2=4

(I) C_8H_{18}

(II) C_2H_6O
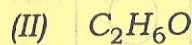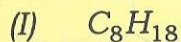
(ii) Why is TMS used as a reference standard in NMR spectroscopy ?
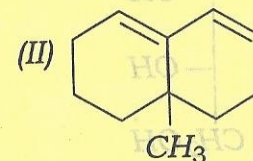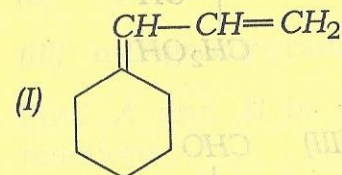3

(iii) Define : 1½×2=3

(I) Spin-spin splitting

(II) Coupling constant

(c) (i) Why is methanol a good solvent for UV spectroscopy but not for IR spectroscopy ? 2

(ii) By using the Woodward-Fieser rules, calculate the absorption maximum for the following compounds : 2×2=4

(I)

(II)

(iii) Explain (by showing the reactions involved) why D-glucose, D-mannose and D-fructose form the same osagene. 4

(d) (i) Classify each of the following monosaccharids according to both the no. of carbon atoms and the type of carbonyl group present : 1×4=4

(I)

(ii) (II)

CHO
—OH
HO—
—OH
—OH
CH₂OH

(III)

CHO
—OH
—OH
CH₂OH

(IV)

CH₂OH
=O
HO—
—OH
CH₂OH
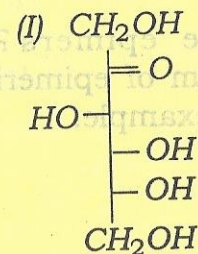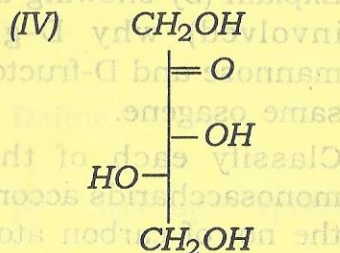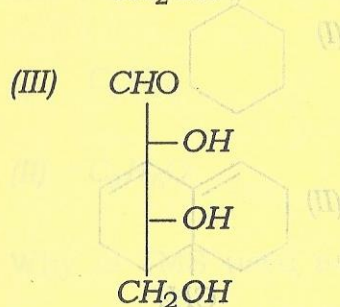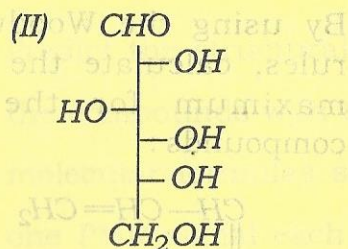
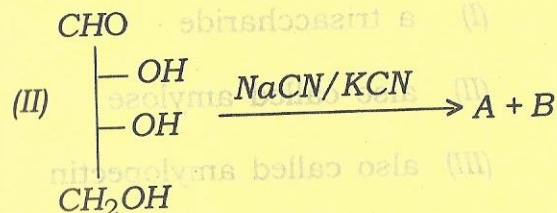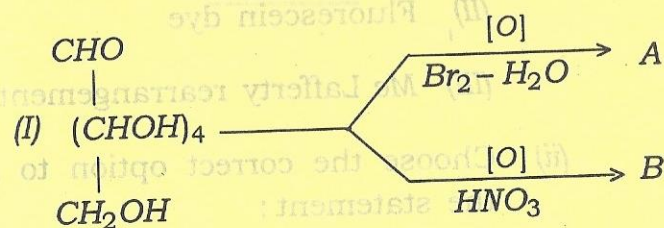(ii) What are epimers? Give the mechanism of epimerisation with suitable example. 1+5=6

(e) (i) Give the Haworth projection diagram of : *(any two)* 1½×2=3

(I) Lactose

(II) Sucrose

(III) α-D-glucopyranose

(ii) Find A and B in the following reactions : 2+2=4

(I)

CHO
(CHOH)₄
CH₂OH

→ [O], $Br_2 - H_2O$ → A

→ [O], HNO_3 → B

(II)

CHO
—OH
—OH
CH₂OH

$\xrightarrow{NaCN/KCN}$ A + B

(iii) Draw the most stable conformer of—

    (I) α-D-glucose, and

    (II) β-D-mannose.

    (in polar solvent)   1½×2=3

(f) *(i)* Explain with suitable example : *(any two)*   2×2=4

    (I) Chain-growth polymerisation

    (II) Fluorescein dye

    (III) Mc Lafferty rearrangement

(ii) Choose the correct option to fill the statement :   1

    "Starch is____."

    (I) a trisaccharide

    (II) also called amylose

    (III) also called amylopectin

    (IV) mixture of amylose and amylopectin

(iii) Give *one* example of each of the following :   1×2=2

    (I) Carbohydrate that acts as a biofuel.

    (II) Write two uses of congo red.

(iv) Illustrate the process of Killiani-Fisher synthesis of an aldotetrose from an aldotriose.   3

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