

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

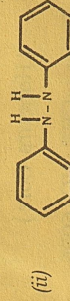
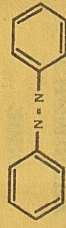
1. Answer the following questions : 1×7=7

- Draw the Fischer projection formula of the C-2 epimer of D-glucose.
- Ethyl acetate shows carbonyl stretching frequency at 1735 cm^{-1} whereas phenylacetate shows at 1770 cm^{-1} . Why?

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- Predict which one of the following will have higher λ_{max} value?



- Draw the Haworth presentation of β -D-glucopyranose.
- What are plasticisers? Give an example.
- Aldehyde proton appear quite downfield in NMR spectrum. Give the name of this "effect".
- How many ^1H NMR signals are obtained for cyclohexane at low temperature? Why?

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

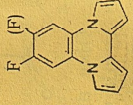
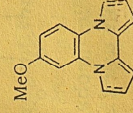
- How the ring size of a monosaccharide can be determined by oxidation with periodic acid? Explain with an example.
- Draw the structures of different types of polypropylene based on tacticity.

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(c)

- State the electronic transition that is most common in the following molecules. In which EMR range this transition occurs. Identify the bathochrome and hypsochrome in the following compounds.



- Show the β -1,4-glycosidic linkages between glucose units in cellulose drawing a polymeric chain structure of cellulose.

3. Answer **any three** of the following : $5 \times 3 = 15$

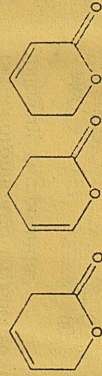
- What is anomeric effect? Explain why α -D(+)-glucopyranose is less stable than β -D(+)-glucopyranose, whereas methyl- α -D(+)-glucopyranoside is more stable than its β -anomer. $2+3=5$
- Phenolphthalein is colourless in acidic/neutral medium, pink in alkaline medium and again colourless in strongly alkaline medium. Explain showing the structural changes that occurs to phenolphthalein. 3

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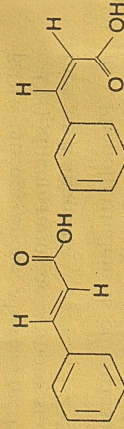
- (ii) Giving reason arrange the following compounds in order of increasing wavelength of absorption in their IR spectra. 2



- (c) (i) Give a suitable mechanism for synthesis of PAN using a suitable anionic initiator. 3

- (ii) Calculate molar absorptivity $\epsilon_{\max}$ of $1.0 \times 10^{-3} \text{ mol/L}$ of a solution of a compound in a 1 dm cell at $\lambda_{\max} = 210 \text{ nm}$, with $A = 1.2$. 2

- (d) (i) Differentiate the following isomeric cinnamic acid molecules using $^1\text{H NMR}$ spectroscopy. 2



- (ii) Classify dyes on the basis of chemical structure with examples. 2

- (iii) What is Fermi resonance? 1

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- (e) (i) Give a method for synthesis of BuNa-S rubber. 3

- (ii) Amylopectin is a _____ polymer of _____ with _____ glycosidic linkage between _____ carbon atoms of subsequent monomeric units. 2
(Fill in the blanks)

4. Answer **any three** of the following : $10 \times 3 = 30$

- (a) Spectral analysis of an organic compound A, with molecular formula $\text{C}_5\text{H}_8\text{O}_3$ gives the following data:
 $^1\text{H NMR}$:

δ values	Intensity	Multiplicity
2.2	3	singlet
2.4	2	triplet
2.7	2	triplet
11.1	1	singlet

IR : 1715 and 1740 cm^{-1} ; 2950 cm^{-1} , 3030 cm^{-1} , $3500\text{--}2500 \text{ cm}^{-1}$; no doublet between 2720 and 2820 cm^{-1} .
UV $\lambda_{\max} 283 \text{ nm}$ (ϵ^{25})

Compound A does not reduce Fehling solution but gives effervescence with sodium bicarbonate.

- (i) Mention the electronic transition responsible for the $\lambda_{\max}$ 283 nm in the UV spectrum?

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- (ii) Which peaks in the IR spectrum indicates the presence of Carboxylic acid group in the compound A?

- (iii) How many equivalent hydrogens are there in the compound? Assign the δ values to these hydrogens in the compound.

- (iv) Calculate DBE of compound A.

Considering all the spectral data, find the structure of A with peak assignments.

- (b) (i) Explain anisotropic effect and state why acetylenic proton absorbs at lower δ values in comparison to ethylenic protons in $^1\text{H NMR}$ spectra. 4

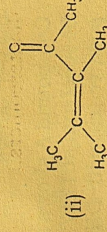
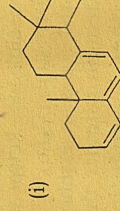
- (ii) Different isomeric compounds are possible with the molecular formula $\text{C}_4\text{H}_9\text{Cl}$. Among these isomers propose the structures of the two isomers with the following $^1\text{H NMR}$ specifications. 3

- (a) Isomer with only a single peak.
(b) Several peaks including two distinct three proton signals, one of them a triplet at $\delta 1.0$ and other a doublet at $\delta 1.5$.

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- (iii) Calculate $\lambda_{\max}$ for $\pi \rightarrow \pi^*$ transition in the following compounds : 3



Homoannular conjugated diene's base value = 253 nm

Heteroannular conjugated diene's base value = 215 nm

Increment for each substitution

Alkyl substituent or ring residue = 5 nm

Exocyclic double bond = 5 nm

Double bond extending conjugation = 30 nm

Acyclic enone base value = 215 nm

α -Alkyl group or ring residue = 10 nm

β -Alkyl group or ring residue = 12 nm

γ -Alkyl group or ring residue = 17 nm

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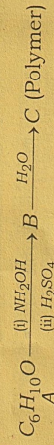
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(c) (i) Write reactions involved in the Molisch's test for carbohydrates. 3

(ii) How many epimeric pairs are possible for a ketose with molecular formula $C_5H_{10}O_5$? Draw the structures in Fischer projections. Mention whether these pairs are either enantiomers or diastereomers. 4

(iii) Compound A shows strong peak in IR spectrum at 1717 cm^{-1} and give positive test with DNP. on reaction with hydroxylamine and followed by a well known Beckmann rearrangement gives compound B. Compound B polymerizes to give polymer C. Identify, give name and structural formula of the compounds A, B and C (polymer). 3



(d) (i) Give the structural formula of the following : 2

- (a) Congo red
(b) Methyl orange

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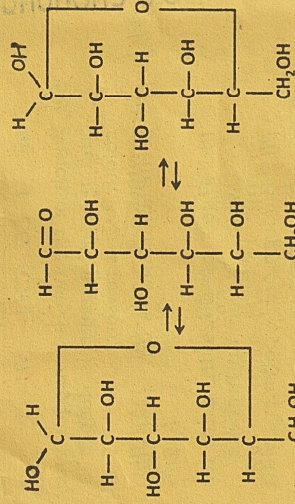
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(III) Synthesis and applications of Nylon 6,6

(ii) What is hyperfine splitting in EPR spectroscopy? Explain the hyperfine splitting pattern of methyl radical. 3

(iii) What is fingerprint region in FTIR spectroscopy ? 1

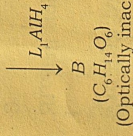
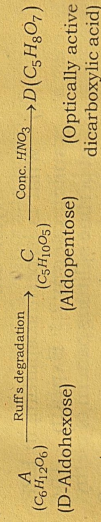
(f) In aqueous solution glucose exhibits the following equilibrium. What is the phenomenon responsible for this equilibrium? Explain the phenomenon with a suitable mechanism. How does it support the cyclic structure of glucose? 3



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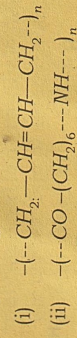
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(ii)



Assuming all sugars belong to D-series, deduce the structures of A, B, C, D and write all the reactions. 4

(iii) Deduce possible monomers for polymers with the following repeating units. 2



(iv) Which of the two, o-benzoquinone and p-benzoquinone is deeper in colour? Give reason. 2

(e) (i) Write short notes on : (any two) $3 \times 2 = 6$

- (f) Uses of alizarin and its synthesis from anthracene
(II) Biodegradable polymers with two examples

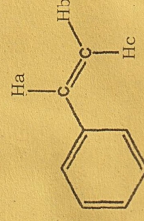
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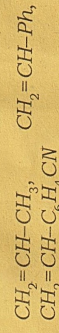
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(ii) What is leuco base in triphenylmethane dyes? Explain with appropriate reaction. 2

(iii) Describe the splitting pattern of protons 'b' and 'c' in the following compound with the help of a diagram. Give J values also. 2



(iv) Which of the following monomer will undergo anionic addition polymerization easily? Write the mechanism of anionic addition polymerization taking this monomer as example. 3



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