Total number of printed pages–10

2 SEM PG CHM (CBCS) OC–II 202

2025

(June)

CHEMISTRY

Paper : Core-202 (C)

(Organic Chemistry–II)

Full Marks : 60

Time : Three hours

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

Write the answer of **Unit-I & II** in one book and **Unit-III & IV** in a separate book

UNIT–I

(Marks: 15)

1. Answer the following questions : 8

   (a) Discuss the structure elucidation of Piperine or Papaverine. 3

(b) How is the presence of phenanthrene ring determined in Morphine ? 1

(c) Explain Hofmann's exhaustive methylation method with example. 2

(d) How is methylmorphol synthesized from 3-acetoxy-4-dimethoxy-2-nitro-benzaldehyde ? 2

Or

How piperine is synthesized starting from catechol.

2. Answer the following questions : 7

(a) Discuss the significance of isoprene rule. 2

(b) Answer ***any one*** of the following : 1

(i) Write the Diels-Alder synthesis of (±)α-Terpeneol.

(ii) Write the structure of two isomers of pinene.

(c) Answer ***any one*** of the following : 2

(i) How will you establish that linalool contains one tertiary alcohol group ?

(ii) How will you synthesize α-terpineol from *p*-toluic acid ?

(d) Answer ***any one*** of the following : 2

(i) Write the Ryoji Noyori asymmetric synthesis of (–)-Menthol.

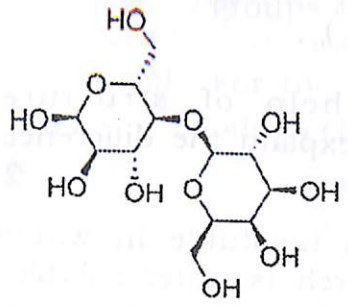
(ii) Outline the steps involve in the synthesis of camphor.

UNIT–II

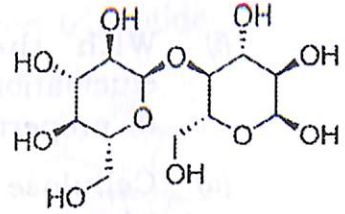
(Marks: 15)

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

(a) Lactose and Maltose are represented by the molecular formula of $(C_{12}H_{22}O_{11})$. Establish the structure given below and point out their differences. 3

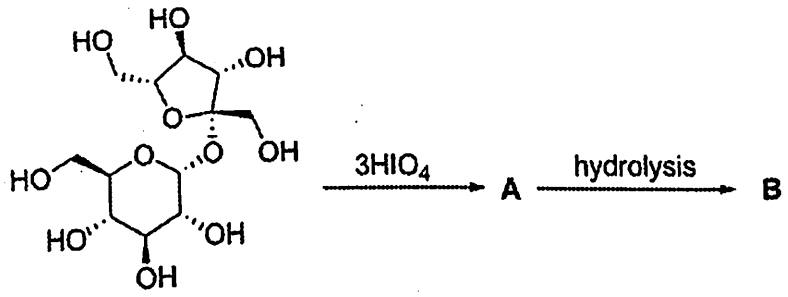


Lactose



Maltose

(b) "Fructose shows mutarotation whereas sucrose does not undergo mutarotation". Explain with structure. Predict the structure of compounds (A) and (B). 1+2=3



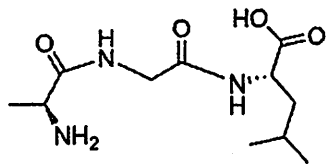
sucrose

(c) Starch and cellulose are made of same glucose monomer unit and have same formula $(C_6H_{10}O_5)_n$.

(i) With the help of structure elucidation explain the difference in properties. 2

(ii) Cellulose is insoluble in water whereas starch is water soluble. Explain why ? 1

(d) Considering the given tripeptide, 1½×2=3



Ala-Gly-Leu

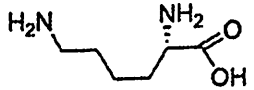
Answer the following questions with proper reagents and reaction condition,

(i) Synthesis in solution phase.

(ii) Synthesis in solid phase.

(e) Answer the following questions :

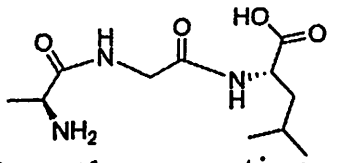
(i) For the given amino acid,



mention strategies to protect and de-protect the different $-NH_2$ groups for peptide synthesis. 1½×2=3

(ii) For the given tripeptide

Ala → *Gly* → *Leu*,



Write the reaction for the determination of C-terminal amino acid in peptide analysis. 1½×2=3

(f) Describe Edman's method for the determining N-terminal group in a polypeptide using a proper example. (showing all reagents) 3

(g) Write a note on : 1½×2=3

(i) Denaturation of proteins

(ii) Proteins modelling

UNIT–III

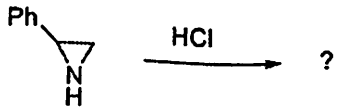
(Marks: 15)

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

(a) (i) Suggest the reagent for the conversion of β-bromoethylamine to aziridine. 1

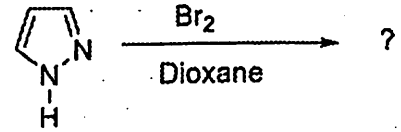
(ii) Complete the following ***two*** reactions : 2

(A) $Ph-CH=CH_2$ $\xrightarrow[KOH,\ H_2O]{INCO,\ MeOH}$?

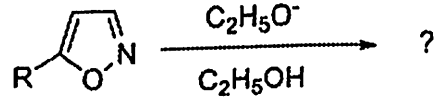
(B)  ?

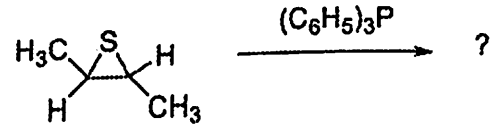
(b) (i) Explain why pyrazole has a higher boiling point (187°C) than its N-alkylated derivatives. 2

(ii) Complete the following reaction- 1



(c) Complete the following reactions- 1½×2=3

(i) 

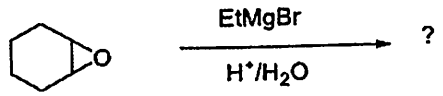
(ii) 

(d) How will you convert an aldehyde to isoxazole via 1,3-dipolar cycloaddition ? 3

(e) Define click reaction with an example. Suggest two catalysts each for 1,4- and 1,5- disubstituted 1,2,3-triazole synthesis using click reaction.

(f) (i) Explain why electrophilic substitution does not occur at C-2 position of imidazole ring. 2

(ii) Write down the product of the following reaction :



UNIT–IV

(Marks: 15)

5. Determine the structure of the compound having the following data : ***(any two)*** 3×2=6

(a) Molecular formula : $C_8H_{12}O_4$

$IR(cm^{-1})$: 3030, 2900, 1740, 1660, 970

$^1H-NMR(\delta\ ppm)$: 6.75(s,1H), 2.25(q,2H), 1.25(t,3H)

$^{13}C-NMR(\delta\ ppm)$: 14, 60, 116, 168

(b) Molecular mass : 113

$IR(cm^{-1})$: 2960, 2270, 1745

$^1H-NMR(\delta\ ppm)$: 1.28(t,area 12), 3.4(s,area 8), 4.25(q,area 8)

$^{13}C-NMR(\delta\ ppm)$: 12, 25, 60, 115, 165

(c) Molecular formula : $C_{10}H_{12}O_2$

$IR(cm^{-1})$: 1711

$^1H-NMR(\delta\ ppm)$: 2.1(s,3H), 3.6(s,2H), 3.8(s,3H), 6.9(d,2H), 7.2(d,2H)

$^{13}C-NMR(\delta\ ppm)$: 29, 50, 55, 114, 126, 130, 159, 207

6. The chemical shift (δ) values for inside and outside hydrogens of 18-annulene are respectively. 1

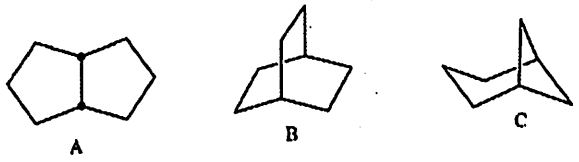
(a) 2, 8

(b) -1.9, 8.8

(c) 8, 2

(d) 8.8, -1.9

7. Decoupled ^{13}C NMR spectrum of bicyclooctane A-C are 2



(i) 5, 4, 8 (ii) 3, 2, 5

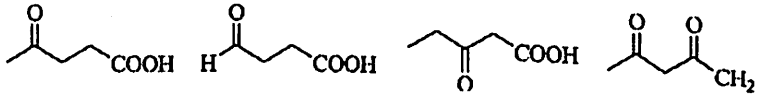
(iii) 5, 4, 5 (iv) 3, 2, 8

8. An organic compound with molecular weight 116 exhibits the following spectral data.

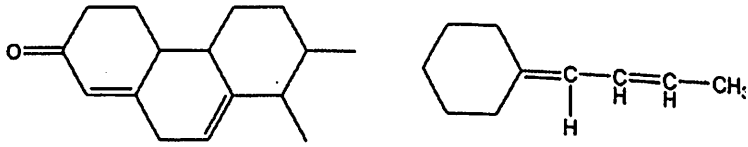
$IR: 3000-2500, 1715, 1340\ cm^{-1}$

$^1H\ NMR: \delta 2.6(t,2H), 2.25(t,2H), 9.02(s,1H), 11.1(s,1H)$

The structure of the compound is 2



9. Calculate the λ_{max} value of the following compounds 2



10. Using McLafferty rearrangement show the fragmentation of butanal and 2-pentanone. 2