



WEST BENGAL STATE UNIVERSITY
B.Sc. Honours 5th Semester Examination, 2022-23



CEMACOR12T-CHEMISTRY (CC12)

Time Allotted: 2 Hours

Full Marks: 40

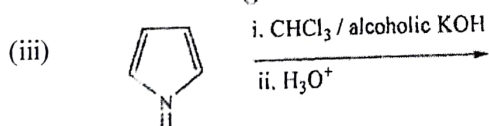
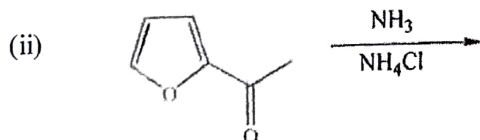
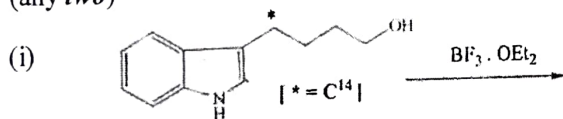
*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer any *five* questions taking *one* from each unit

UNIT-I

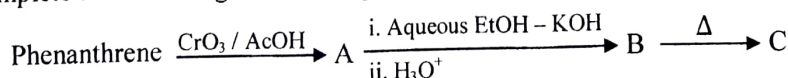
1. (a) Indole cannot be synthesised from acetaldehyde and phenyl hydrazine by Fischer's method — Why? How would you modify the starting materials to synthesise N-methylindole? 1½+1½

- (b) Predict the product(s) in the following reactions with plausible mechanism. 2×2 = 4
(any *two*)

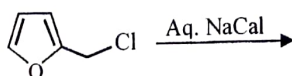


- (c) 2-Methyl-1-naphthol easily couples with benzene diazonium chloride in alkaline medium but 1-methyl-2-naphthol fails to couple with benzene diazonium chloride under identical conditions. Explain. 3

2. (a) Complete the following reaction sequence with necessary explanations: 3



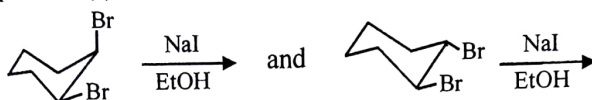
- (b) Write down the product of the following reaction with plausible mechanism. 2



- (c) How can you convert naphthalene into 9-methyl anthracene? 3
(d) How can you convert pyridine into 4-nitropyridine? 2

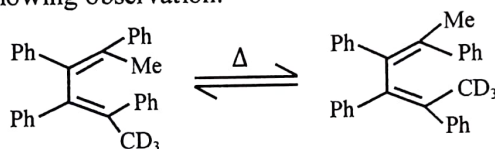
UNIT-II

3. (a) Count the number of destabilising interactions in (1R,2S)-1,2-dimethylcyclohexane. Is the molecule chiral? Will it show any optical rotation at room temperature? Explain your answer. 3
- (b) Draw energy profile diagram for ring inversion of cyclohexane through the energetically most favourable pathway. Identify the chiral conformations involved in this process. 3
4. (a) Cite an example of a substituted cyclohexane system where the conformation with the axial substituent is more stable than the equatorial one. Explain the reason behind it. 2
- (b) Identify the product(s) in the following reactions with proper mechanism: 2+2

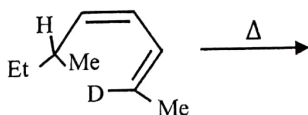


UNIT-III

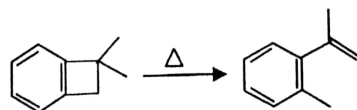
5. (a) Compare the rates of Diels-Alder reaction of isoprene and 2-t-butyl-1,3-butadiene separately with tetracyanoethylene. 2
- (b) Explain the following observation: 2



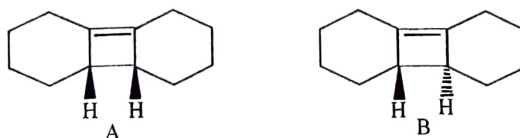
- (c) Predict the product(s) with stereochemistry of the following reaction. Designate the pericyclic step involved. 2



6. (a) Suggest a mechanism for the following reaction clearly indicating the pericyclic process involved therein. 2



- (b) Which of the following compounds will undergo thermal electrocyclic ring opening at a faster rate? — Explain. 2



- (c) Thermal [1,5] hydrogen shift is facile, but [1,3] hydrogen shift is not observed. Explain. 2

UNIT-IV

7. (a) How would you distinguish chemically between D-glucose and D-fructose? 2
 (b) An aldopentose 'A' can be oxidised to an optically active aldaric acid 'B'. Degradation of 'A' gives 'C'. Oxidation of 'C' produces an optically inactive aldaric acid 'D'. 'A' belongs to 'D'-family. Give the structures of '(A-D)' with reasons. 3
 (c) What is anomeric effect? How does it vary with solvent polarity? 3
8. (a) Between $\text{Br}_2\text{-H}_2\text{O}$ and Tollens' oxidation which one do you think to be superior for conversion of D-glucose to D-gluconic acid? Justify your choice. 2
 (b) How can you prove that all methylpyranosides of the $\alpha\text{-D-hexose}$ series have identical configurations at C-1 and C-5? 2
 (c) Sucrose does not show any change in specific rotation when dissolved in water. Explain. 2
 (d) Convert D-Glucose to $\text{CH}_2\text{OAc}-(\text{CHOAc})_4-\text{CHO}$. 2

UNIT-V

9. (a) Write down the structure of L-proline. How can you synthesise proline by Gabriel's phthalimide synthesis? 4
 (b) Between A-T and G-C which base pair is stronger and why? 2
 (c) Alkaline hydrolysis of RNA occurs faster than that of DNA. Explain. 2
 (d) How can you separate the components of the mixture of glycine, lysine and glutamic acid? (Isoelectric points of glycine, lysine and glutamic acids are 6.0, 9.5 and 3.1, respectively). 2
10. (a) How can you achieve the synthesis of gly-phe using Merrifield resin? 3
 (b) Acid hydrolysis of guanosine occurs faster than that of adenosine. Explain. 2
 (c) Activation of the $-\text{COOH}$ of an amino acid through its conversion into COCl may not be useful for peptide bond formation when the amino group is protected in the form of benzyl urethane. Offer an explanation. 3
 (d) What happens when the tripeptide ala-val-phe is heated with anhydrous hydrazine at 100°C ? 2

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