

CHEMISTRY

Paper – II

Time Allowed : Three Hours

Maximum Marks : 200

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

There are **EIGHT** questions in all, out of which **FIVE** are to be attempted.

Questions no. **1** and **5** are compulsory. Out of the remaining **SIX** questions, **THREE** are to be attempted selecting at least **ONE** question from each of the two Sections A and B.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it. Answers must be written in **ENGLISH** only.

Unless otherwise mentioned, symbols and notations have their usual standard meanings.

Assume suitable data, if necessary, and indicate the same clearly.

Neat sketches may be drawn, wherever required.

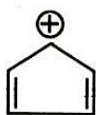
SECTION A

Q1. Answer the following :

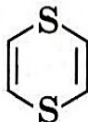
5×8=40

- (a) Classify the following compounds as aromatic, antiaromatic and non-aromatic. Explain your answer.

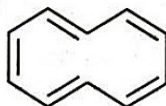
5



A



B



C



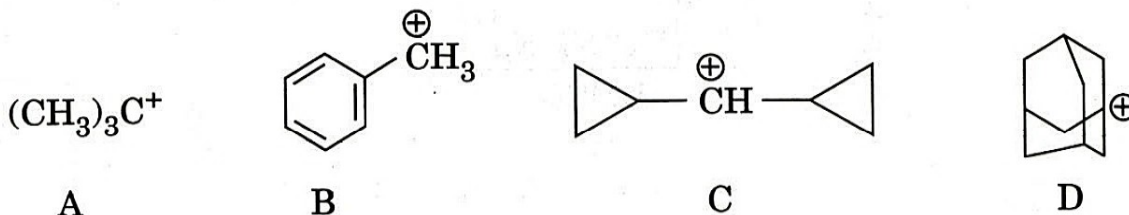
D

- (b) Discuss the role of crossover experiments in determining the reaction mechanism.

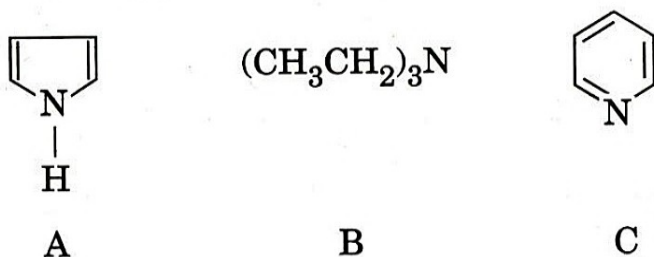
5

(c) Quinuclidine reacts much faster with ethyl iodide than triethyl amine in S_N2 reaction. Explain. 5

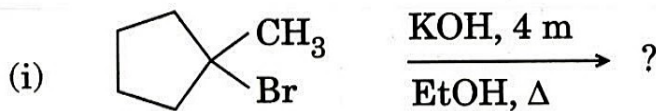
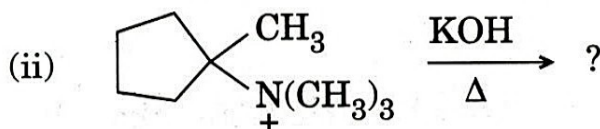
(d) Arrange the following carbocations in decreasing order of their stability. Give reason in support of your answer. 5



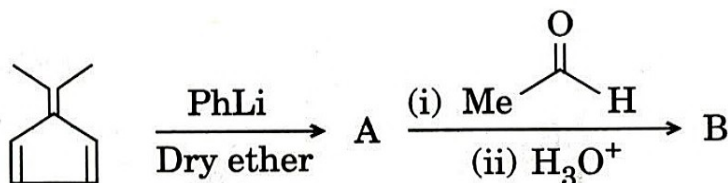
(e) Arrange the following in decreasing order of basicity. Give explanation to justify your answer. 5



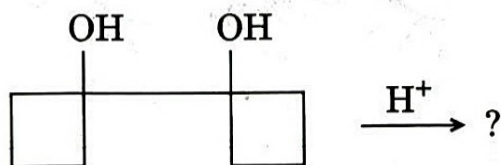
(f) Write the products formed in the following reactions : 5



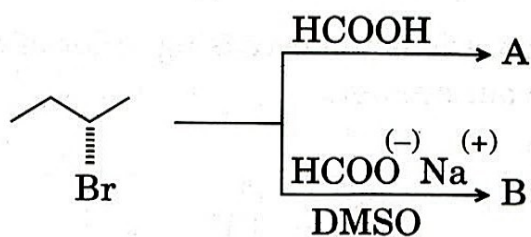
(g) Write the products formed in the following reaction sequence : 5



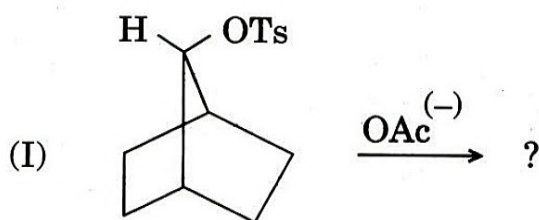
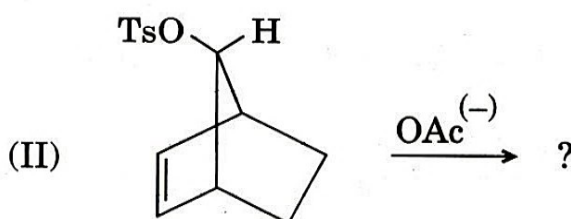
(h) Write the product and mechanism of the reaction : 5



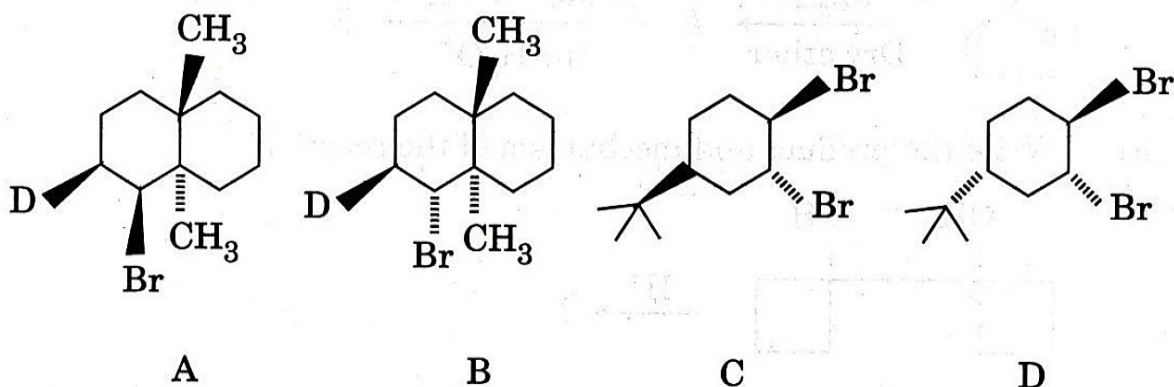
- Q2. (a) (i) Write the outcome of the reaction and predict the reaction to S_N1 or S_N2 in each case.



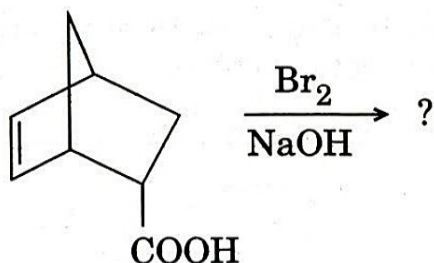
- (ii) Show the products of the following reactions :



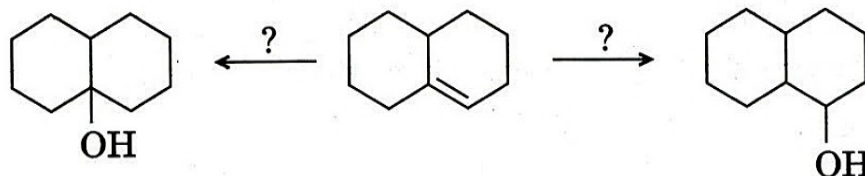
- (b) On attempted E_2 reaction, A reacted much faster than B, while C reacted much faster than D. Explain with writing the product of the reaction in each case.



- (c) (i) What product can one expect from the following reaction ? Depict the stereochemical outcome at every step. 5

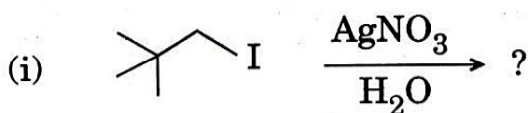
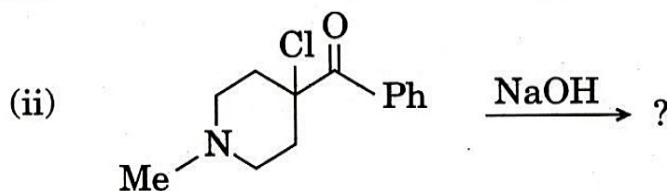


- (ii) What reagents are needed to bring the transformation ? 5

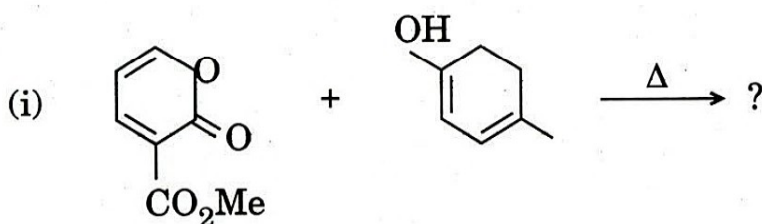
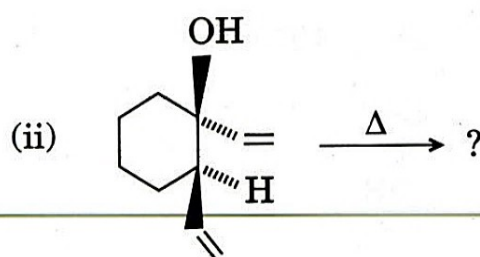


- (d) Write a short note on aromatic character of sydnones. 10

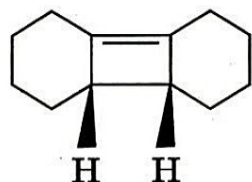
- Q3.** (a) Write the structure of the product formed. 10



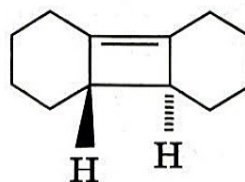
- (b) Complete the following pericyclic reactions : 10



- (c) (i) Explain correlation diagrams for electrocyclic interconversion of 1,3-butadiene and cyclobutene. 5
- (ii) One of the cyclobutenes on heating reacts very fast while the other reacts at extremely slow rate. Explain. 5

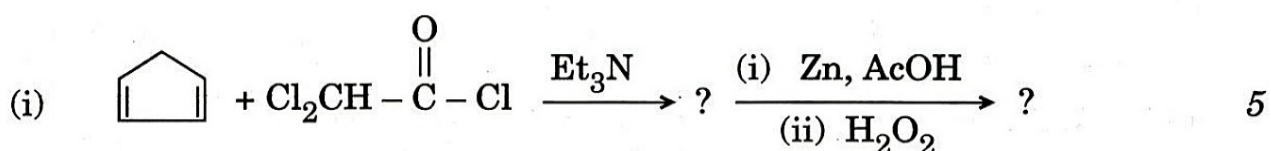
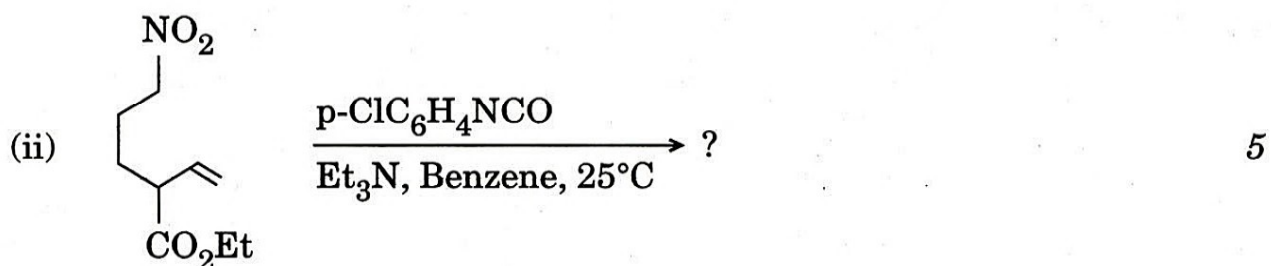


A

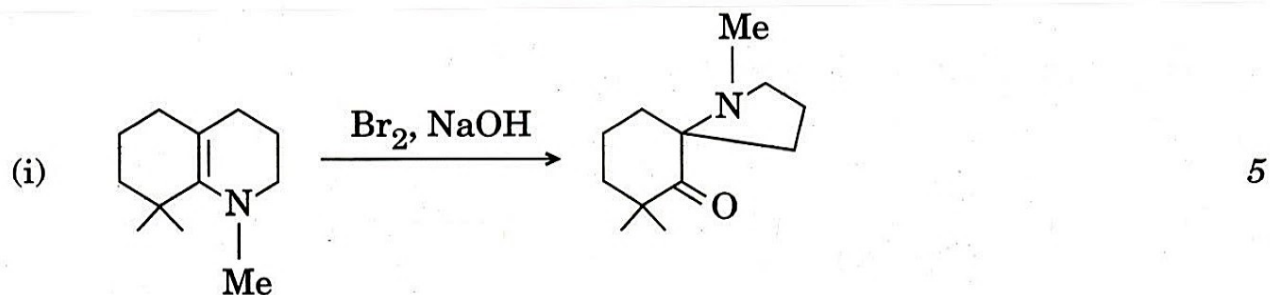
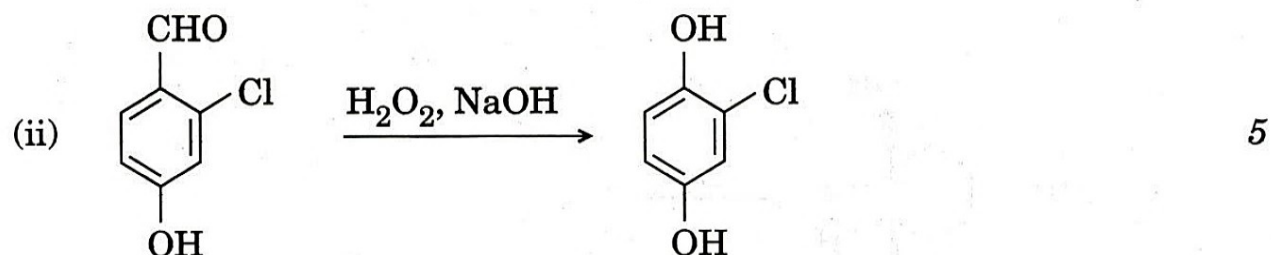


B

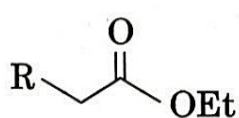
- (d) Write the products in the following reactions : 10



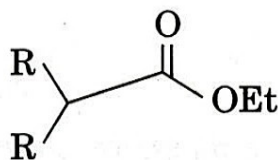
- Q4.** (a) Suggest a mechanism for the following reactions : 10



- (b) Claisen-ester condensation is possible with substrates of type A but not possible with type B. Explain by writing the mechanism. 10

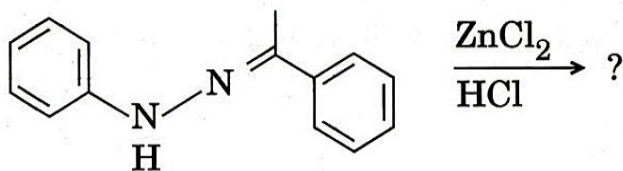


A



B

- (c) Discuss the mechanism of the reaction by writing the product. 10



- (d) What are stabilized and unstabilized ylids ? How does E-Z selectivity in Wittig reaction depend upon the nature of ylid ? Explain. 10

SECTION B

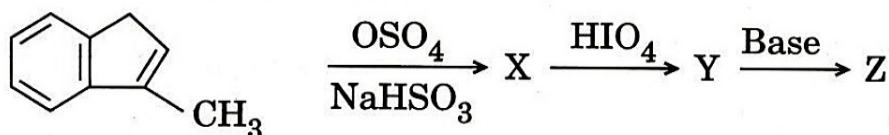
Q5. Attempt the following :

5×8=40

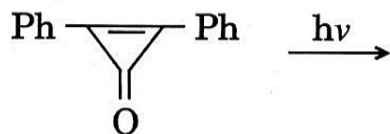
- (a) Write the names of monomers of the following polymers and classify them as addition or condensation polymers : 5
- (i) Teflon
- (ii) Bakelite

- (b) Name the products obtained on complete hydrolysis of DNA and give their structures. 5

- (c) Write the structure of X, Y and Z. 5



- (d) Formulate the product(s) and give the mechanism for the following reaction : 5



- (e) A compound contains two types of protons which exhibit signals at 139.2 Hz and 430.2 Hz downfield from TMS in a spectrometer operating at 60 MHz. What will be their relative position when measured on a 100 MHz instrument ? 5
- (f) Explain the following variations in λ_{max} (in nm) of CH_3Cl (173), CH_3Br (204), CH_3I (258). 5
- (g) Why is a bathochromic shift observed with increasing conjugation in electronic spectra ? Explain. 5
- (h) What is McLafferty rearrangement in Mass Spectrometry ? Mass spectrum of 1-phenyl butanone exhibits m/z (mass by charge) 105 as a base peak and m/z 120 as one of the major peaks. Explain. 5

- Q6.** (a) Calculate $\overline{M}_n$ and $\overline{M}_w$ for a polymer that consists of 10% by weight of a macromolecule of molecular weight 10,000 and 90% by weight of a macromolecule with molecular weight 1,00,000. 10
- (b) How will you determine the molecular weight of a polymer solution using Ostwald viscometer? 10
- (c) State whether *true* or *false*. If false, give the correct statement. 2×5=10
- (i) Polyvinyl alcohol can be prepared by polymerization of vinyl alcohol.
 - (ii) CH_4 can be polymerized.
 - (iii) C_2H_2 and aniline cannot be polymerized.
 - (iv) Polymers have sharp melting point.
 - (v) Ziegler-Natta catalyst is used for the preparation of syndiotactic polymer.
- (d) What is an oligopeptide? How is it different from a polypeptide? What is the secondary structure of protein? 10

- Q7.** (a) An organic liquid with molecular formula $\text{C}_6\text{H}_{10}\text{O}$ gave the following spectral data :

UV : ν_{max} 230 nm (ϵ 12600), 329 nm (ϵ 41)

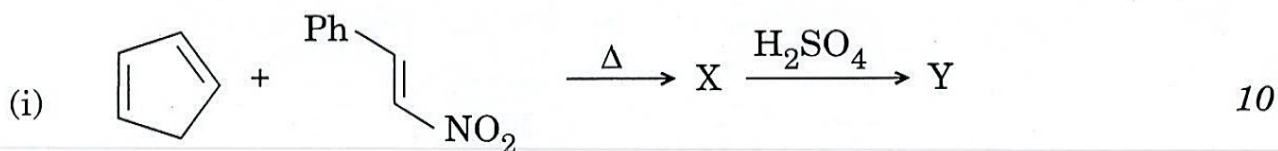
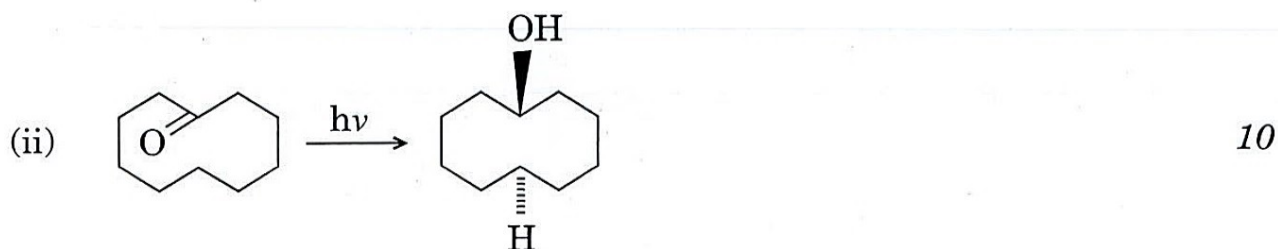
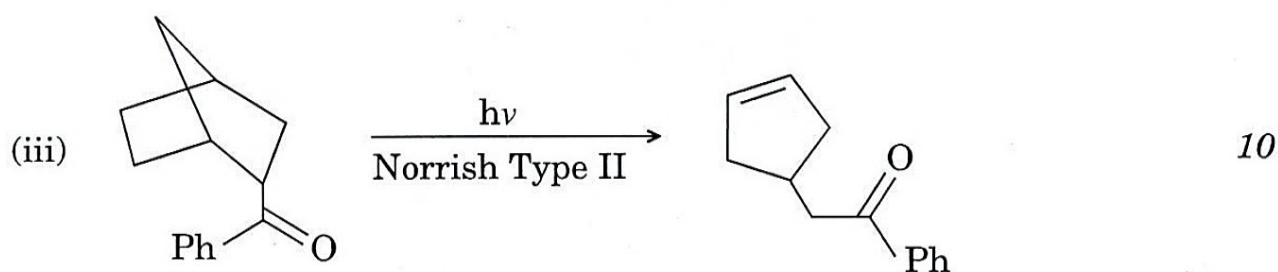
IR : ν_{max} 2950 – 2860 (m), 1695 (s), 1620 (m), 1460 (m) cm^{-1}

NMR : δ 1.9 (s, 3H), 2.1 (s, 6H), 6.15 (s, 1H)

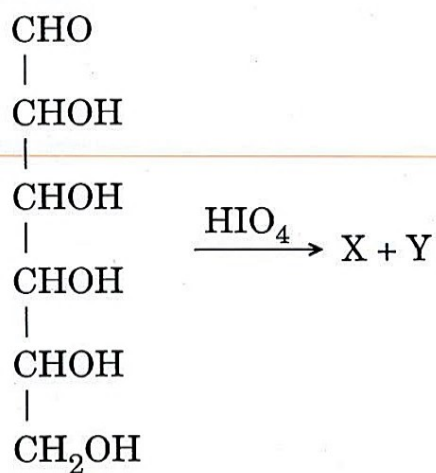
Write the possible structure of compound with suitable justification. Predict its ^{13}C -NMR spectrum. 20

- (b) How can the NMR spectrum distinguish between the isomers — p-xylene and ethyl benzene? Justify your answer. 10
- (c) Give the ESR spectra of Naphthalene negative ion, Anthracene negative ion and Triphenyl methyl radical. 10

Q8. (a) Complete the reactions and give appropriate mechanisms of the following : 10×3=30



(b) (i) Explain how many molecules of formaldehyde and formic acid are formed in the reaction. 5



(ii) Identify the X. 5

