

(2½ Hours)

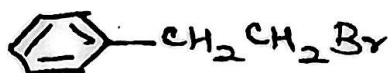
[Total Marks : 60

- N.B. :** (1) All questions are compulsory.
 (2) Figures to the right indicate full marks.

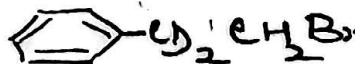
1. (A) Answer any two of the following : -
- (a) Draw the Frost Musulin diagram of cyclobutadiene and show the distribution of electrons in the MOs. Comment on the stability of cyclobutadiene. 4
- (b) Explain the aromaticity of : 4
- (i) Ferrocene (ii) Azulene
- (c) (i) What are homoaromatic compounds? Give an example. 4
- (ii) Explain the thermochemical evidence for aromaticity with a suitable example.
- (d) Explain the significance of the HOMO-LUMO gap in the UV absorption of ethene and butadiene with π -M.O. diagrams. 4
- (B) Answer any one of the following : -
- (a) Draw the π -M.O. diagrams with electron distribution of the reactants in a Diels Alder reaction. Explain the interaction of the FMOs involved in the reaction. 4
- (b)(i) '[10]- Annulene is not aromatic'. Explain. 4
- (ii) Explain magnetic anisotropy in aromatic compounds with reference to NMR spectroscopy.
2. (A) Answer any two of the following : -
- (a) With the help of an energy profile diagram explain: 4
- (i) Hammond's postulate
- (ii) Transition state theory.
- (b) Arrange the following compounds in increasing order of acidity and explain. 4



- (c) Explain the difference between general and specific acid catalysis with suitable examples. 4
- (d) What is Kinetic isotope effect? Compound A undergoes elimination in aqueous ethanol seven times faster than compound B. Is the mechanism E_1 or E_2 ? Explain your conclusion. 4



A



B

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(B) Answer any **one** of the following :-

(a) Illustrate the use of the following techniques in determining reaction mechanism with one example each :

- (i) Detection and trapping of intermediates.
(ii) Crossover experiments.

(b) Choose the stronger base from the following pairs and explain :

- (i) Aniline and ethylamine.
(ii) p-Chloroaniline and p-toluidine.

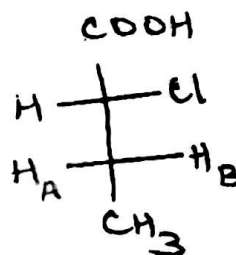
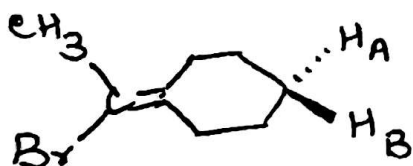
3. (A) Answer any **two** of the following :-

(a) Draw the structure of the four stereoisomers of 2,3,4 - trihydroxyglutaric acid. Label one asymmetric and one pseudoasymmetric centre in any of the stereoisomers and assign appropriate configurational descriptors to these centres.

(b) (i) Explain the difference between C_n and S_n axes of symmetry with suitable examples.

(ii) Explain 'syn-anti' system of nomenclature with an example.

(c) What is prochirality ? Identify the relationship between H_A and H_B in the following and assign appropriate stereochemical descriptors.



(d) Explain the optical activity of the following with one example each.

- (i) ansa compounds
(ii) spiranes

(B) Answer any **one** of the following :-

(a) (i) Explain any one principle of axial chirality.

(ii) Write the structures of :

(I) (R) - BINOL

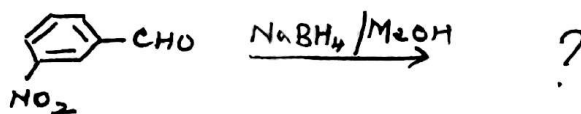
(II) (S) - 4 - Chloropenta - 2,3- dienoic acid.

(b) What are stereoheterotopic faces ? Draw structures of molecules with enantiotopic and diastereotopic faces and assign stereochemical descriptors to these faces.

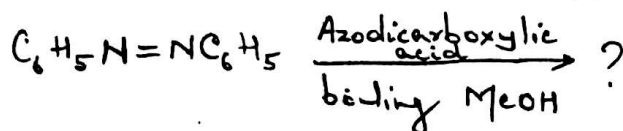
4. (A) Answer any **two** of the following :-

(a) Complete the following reactions with mechanism.

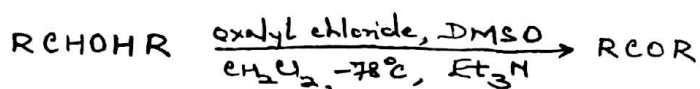
(i)



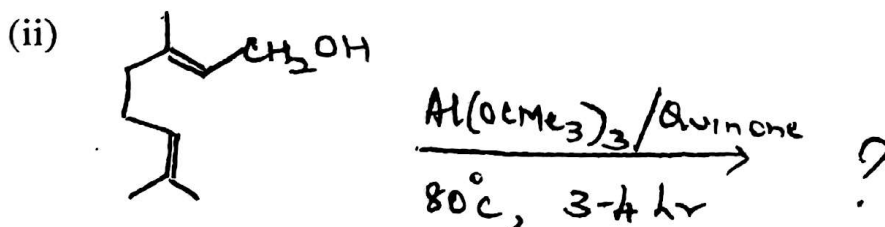
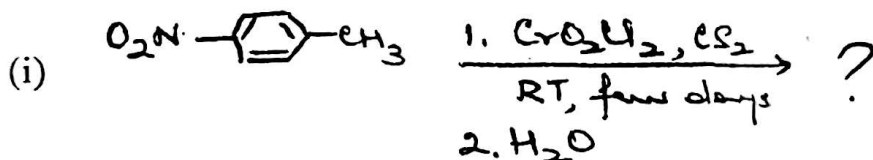
(ii)



(b) Name the following reaction and explain its mechanism :



(c) Complete the following reactions and name them :



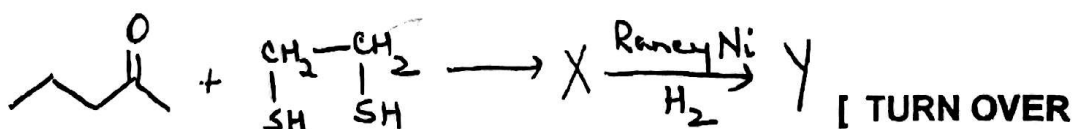
(d) Illustrate the uses of the following in organic synthesis with one examples each.

- (i) LiAlH_4
- (ii) NaBH_3CN
- (iii) K-Selectride
- (iv) Wolff-Kishner reduction

(B) Answer any **one** of the following :

(a)(i) Give an equation to represent reduction by magnesium metal in neutral medium.

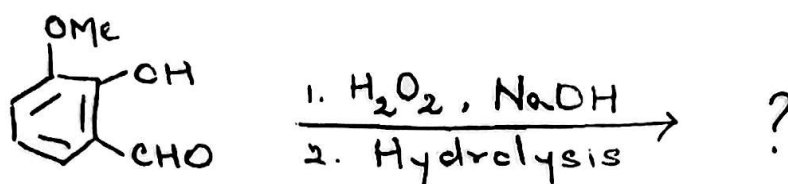
(ii) Predict the products X and Y of the following reaction.



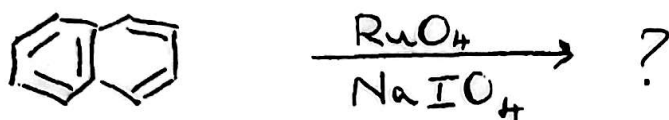
(b) Complete the following reactions :

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(i)



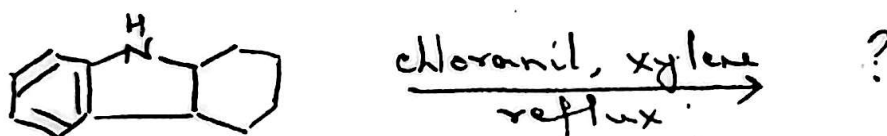
(ii)



(iii)



(iv)



Attempt any four of the following :-

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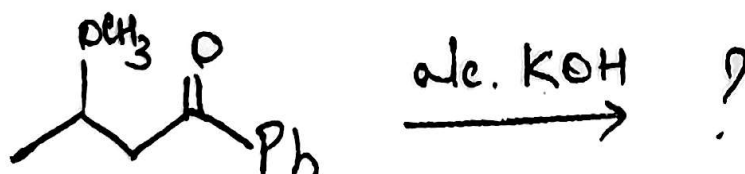
(a) Which of the following are aromatic and why ?



(b) What are hard nucleophiles and hard electrophiles ? Give one example of each.

(c) What is Cope elimination ? Explain its mechanism with a suitable example.

(d) Predict the product of the following reaction and give the mechanism :

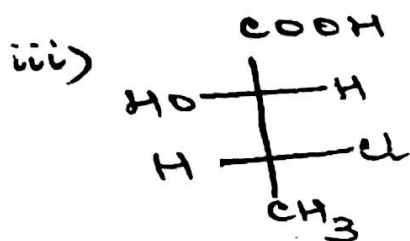
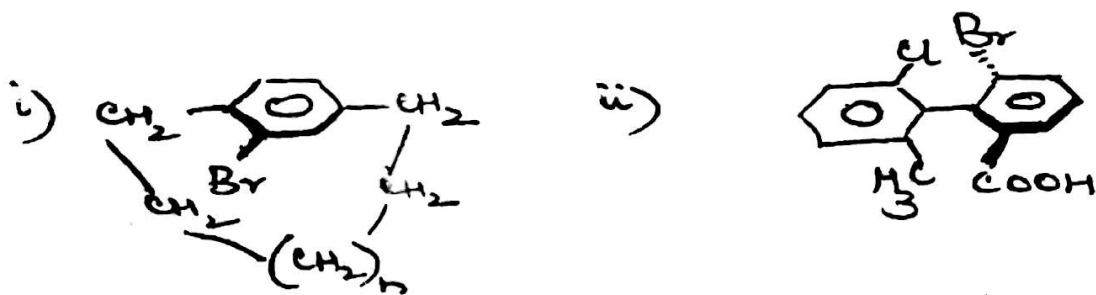


(e) Explain the chirality of the following with suitable examples

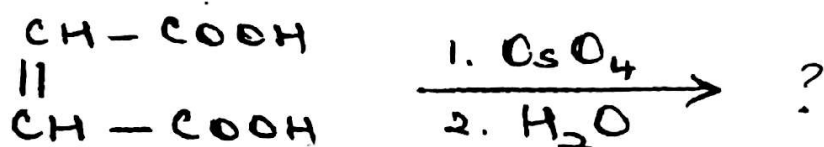
(i) N-oxides

(ii) Sulfoxides

(f) Assign stereochemical descriptors to the following :



(g) Complete the following reaction with mechanism and stereochemistry



(h) Predict the products of the following reaction :

