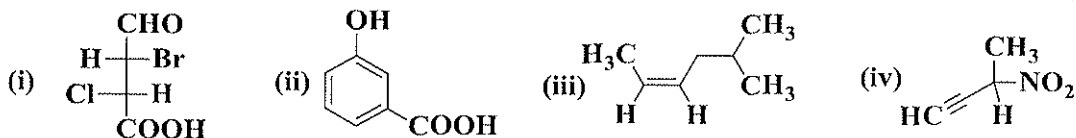


(3 Hours)

Total Marks: 80

- N.B.:** 1. All questions are compulsory
2. Answer all subquestions together
3. Figures to right indicate full marks

Q.1 A) Write the systematic nomenclature as per IUPAC rules. Assign R/S, E/Z or D/L notations wherever relevant (4 M)

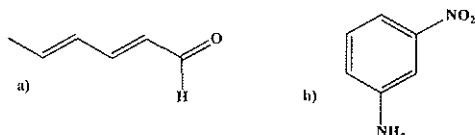


B) Write structures from the following IUPAC names (4 M)

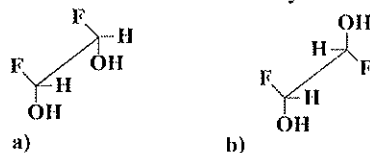
- (i) (R) 4-Chloro-2-methylhexane
(ii) 3-Vinyl-1,4-pentadiene
(iii) (E) 3-Methyl-4-propyl-3-octene
(iv) Ethyl-2-ethylbutanoate

C) Answer the following questions (Any 6) (12 M)

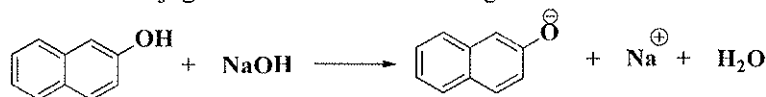
- i. Draw and identify the HOMO and LUMO of Acetaldehyde
ii. Draw resonance for:



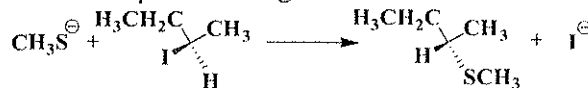
- iii. Represent 1,2-dihydroxypropaneamine using Fischer and Sawhorse projection formulae.
iv. Deduce the relationship between two chiral structures. Justify.



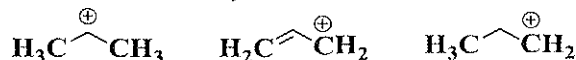
v. Identify conjugate acid and conjugate base from the following reaction



vi. Identify the electrophiles and nucleophiles in the given reactions



vii. Which of the following is more stable? Justify.

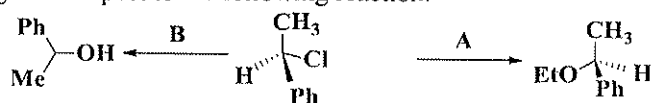


Q.2. Answer the following

- i. Draw the molecular orbital energy diagram for ethene. Label the orbitals. (2M)
ii. Identify the hybridization state of the underlined atom from the given molecules (2M)
a. NH₃ b. H₂O

Turn Over

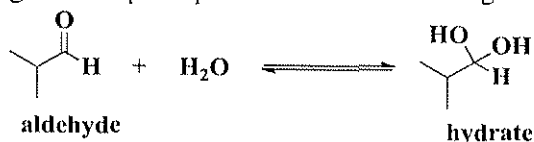
iii. Answer the following with respect to the following reaction: (4M)



(a) Identify the type of reactions A and B.

(b) Which are the preferable solvents used for both the pathways?

iv. Draw the energy profile diagram to depict equilibrium for the following reaction:



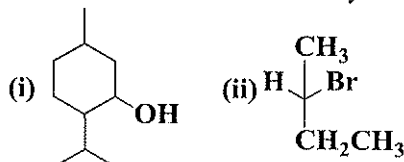
Identify and draw the transition states. State whether the reaction is endothermic or exothermic (4 M)

Q.3 Answer the following

i. Discuss **Ring strain** in cycloalkanes (2 M)

OR

Identify whether the given molecules are chiral or achiral and Justify



ii. Identify the best leaving group F^- , H_2O , NH_3 and Justify. (2 M)

iii. Predict the major product when **2-Bromo-2-methylbutane** reacts with ethanol. Identify the type of reaction and highlight the mechanism. (4 M)

iv. Write a note on hydrogenation of 1-phenyl-1-propyne using minimum two reducing reagents and comment on the stereochemistry of the product. (4M)

Q.4 Answer the following

i. Define Entropy. Comment on ΔG , ΔH and ΔS of the given reaction (4 M)

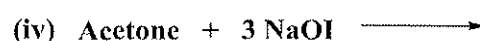
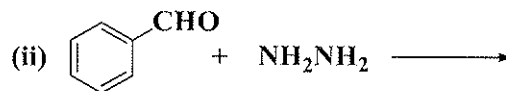


ii. Which one of the following pair is expected to exhibit H-bonding and why. Justify your answer. Methanol and Trimethylamine (2 M)

iii. On the basis of solubility, justify the increasing order of log P for the following compounds

Nitrobenzene (log P = 1.85), chlorobenzene (log P = 2.84), aniline (log P = 0.90) (2 M)

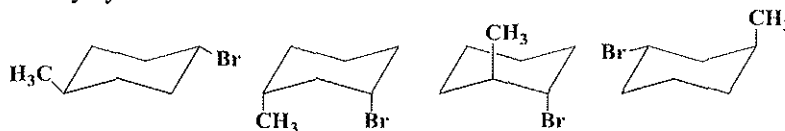
iv. Predict the product (Any 4) (4 M)



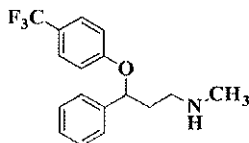
Turn Over

Q.5 Answer the following

- i. Arrange the following in increasing order of basicity and justify. (2 M)
Aniline, *o*-nitroaniline, aminocyclohexane
- ii. Two compounds A and B have pK_a values 7.9 and 3.9 respectively. Which one is the stronger acid? Justify. (2 M)
- iii. a. Which of the following conformations represent 1,3-diaxial interactions? Comment on stability of chair form of 1,2-dimethylcyclohexane (2 M)



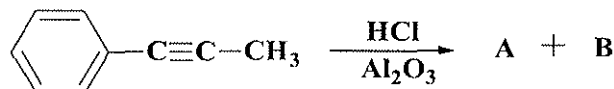
- b. With the help of energy profile diagram, explain diagrammatically conformational analysis of Ethane (2 M)
- iv. Identify the functional group in the given moiety which is responsible for H-bonding and hydrophobic interactions. Suggest a suitable modification of this group which will enhance or decrease this interaction (4 M)

**OR**

An active pharmaceutical agent possesses phenolic, amine and amide functional groups. What precautions should be taken during its formulation?

Q.6 Answer the following

- i. With Predict the product for:

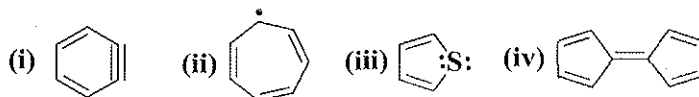


Justify the principle for kinetic vs thermodynamics product formation (4 M)

OR

Explain the energy profile diagram for N-methylacetamide. Draw and discuss the stability of *cis* and *trans* conformations.

- ii. Explain Huckel's rule for aromaticity. Identify whether the following is aromatic, nonaromatic or antiaromatic (Any 3) (4 M)



- iii. Identify A, B, C & D from the given set of reactions: (4 M)

