

17.12.18 (M) ✓

[This question paper contains 8 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : 193 I

Unique Paper Code : 42171103

Name of the Course : **B.Sc.(Prog.)**

Name of the Paper : Atomic structure,
bonding, general
organic chemistry and
aliphatic hydrocarbons.

Semester : I

Time : 3 Hours

Maximum Marks : 75

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt any **three** questions from each Section. Use separate Answer booklet for each Section.

Section - A

1. (a) Write Schrodinger's wave equation and explain various terms involved in it. 2.5

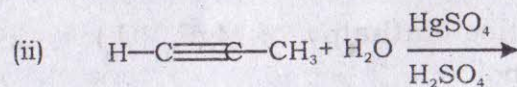
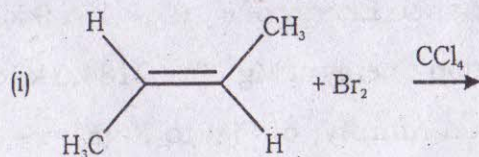
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- (b) Explain as to why orbitals 1p, 2d or 3f are not possible ? 3
- (c) Draw the Molecular Orbital diagram for NO molecule. 3
- (d) Plot radial probability distribution curves for 4s, 4p, 4d and 4f orbitals. 4
2. (a) What is the significance of ψ and ψ^2 ? Explain. 2
- (b) Bond angles in CH_4 , NH_3 , and H_2O are different inspite of same hybridisation. Explain. 3
- (c) Write the hybridization of the central atom and shape of the following molecules : PCl_5 , ClF_3 , SnCl_2 3
- (d) Write the M.O. configuration of O_2^+ , O_2 , O_2^- and O_2^{2-} and arrange them in increasing order of their bond length. 4.5
3. (a) Arrange the following compounds in the increasing order of their hardness : AgF, AgBr, AgCl 1.5
- (b) Explain why He_2 molecule does not exist ? 2
- (c) Write the expression of Born – Lande equation and explain the terms involved in it. 3
- (d) Write short notes on : 6

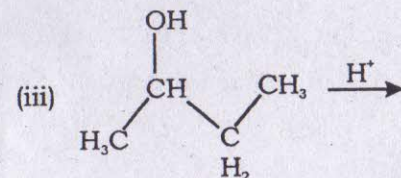
- (i) Heisenberg's Uncertainty Principle
- (ii) Lattice Energy
- (iii) Solvation Energy
4. (a) The observed dipole moment of HX molecule is 1.92 D and bond distance is 1.20 Å. Calculate the % ionic character of the molecule, HX. (electronic charge $e = 1.602 \times 10^{-19} \text{ C}$). 2.5
- (b) What are Eigen functions and Eigen values ? 3
- (c) Explain the stability of half filled and full filled orbitals. 2
- (d) Calculate the heat of formation ΔH_f of MgF_2 from its elements using Born- Haber's cycle with the given data. 5
- Sublimation Energy of Mg, (S) = 146.4 kJmol^{-1}
- Dissociation Energy of F_2 , (D) = 158.9 kJmol^{-1}
- Ionization Energy of Mg^{2+} (I) = $2184.0 \text{ kJmol}^{-1}$
- Electron Affinity of F(g) to F^- (E) = $-334.7 \text{ kJmol}^{-1}$
- Lattice Enthalpy of MgF_2 (U_o) = $-2922.5 \text{ kJmol}^{-1}$

Section - B

5. (i) Differentiate between homolysis and heterolysis using suitable examples. 2.5
- (ii) Explain why tert.-butyl carbocation is more stable than methyl carbocation. 3
- (iii) Draw the energy diagram for the conformations of n-butane. 2
- (iv) Draw all possible stereoisomers of 2, 3-Dibromobutane using Fischer projection. Identify the erythro, threo and the meso forms. Comment on the optical activity of the meso form. 5
- 6 (a) Give the mechanism and product formed in the given reactions : 9

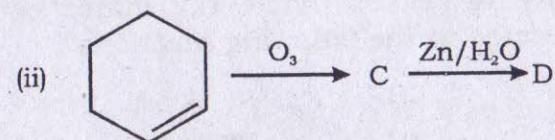
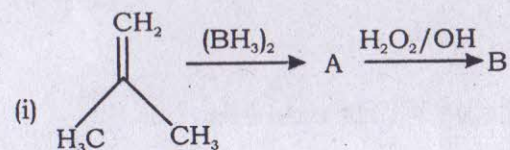


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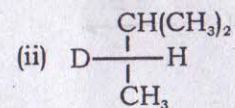
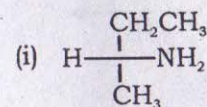


- (b) Complete the following reactions :

3.5

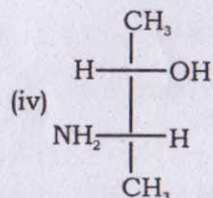
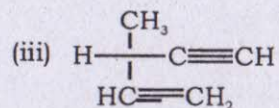


7. (a) Give priority numbers to the groups attached and assign R/S configuration to the chiral centres in the given compounds : 5



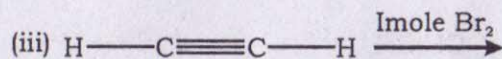
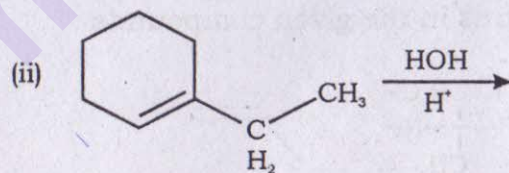
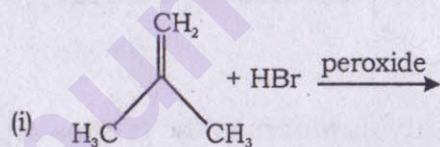
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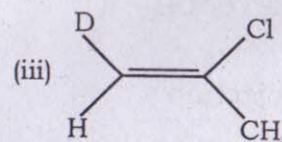
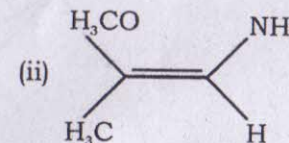
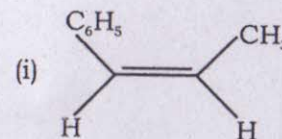


(b) Describe Wurtz reaction. 1.5

(c) Giving reason, write the major product formed in the following reactions : 6



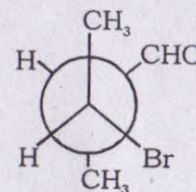
8. (a) Giving priority numbers to the groups attached assign E/ Z to the following geometrical isomers : 6



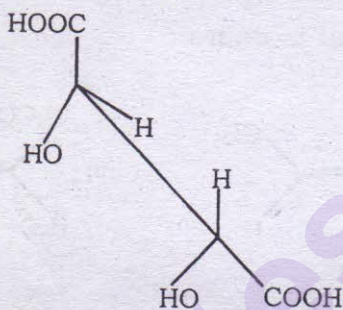
(b) Give stepwise synthesis of acetylene using 1, 2-dichloroethane. 1.5

(c) Convert the following : 5

(i) to Sawhorse projection



(ii) to Fischer Projection



(iii) to Fischer Projection

