[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1883 **GC-3** **Your Roll No.....**

Unique Paper Code : 42171103

Name of the Paper : Chemistry (Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons)

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

Semester : I

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all, three questions from each section.
3. Question No. **1** and Q. **5** are compulsory.
4. Use separate answer sheets for **Section A** and **Section B.**

SECTION – A

1. Account for the following statements :

   (a) Chair conformation of cyclohexane is more stable than the boat conformation.

   (b) Meso compounds are optically inactive.

   (c) Boiling points of branched alkanes are lower than of straight chain isomeric alkanes.

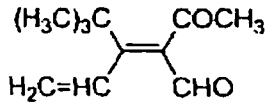
   (d) 2-Methylbut-2-ene is more stable than 3-Methylbut-1-ene.

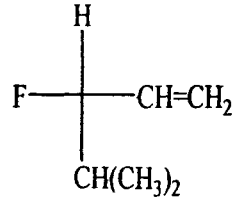
   (e) Methoxy methyl carbocation is more stable than propyl carbocation even though both are primary carbocations.

(f) Anti Markovnikov addition in alkenes is not observed in case of HI and HCl in presence of peroxide. (2.5,2,2,2,2,3)

2. (a) How many optical isomers are possible for 2,3-Dicholoropentane ? Draw their fischer projections and give the relationship between them. Also assign absolute configuration (R/S) at each chiral center. (2,2,3,2)

(b) Explaining the priority order, assign E/Z or R/S configuration to the following :

(i) 

(ii) 

(3)

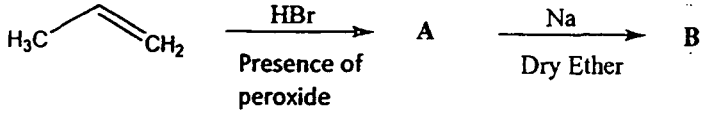
3. (a) Carry out the following conversions :

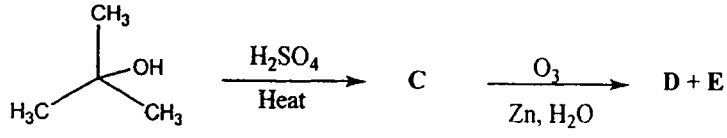
(i) Propene to Propan-1-ol

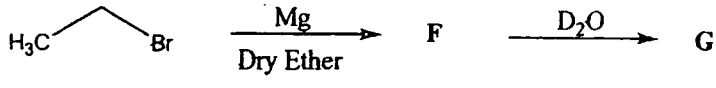
(ii) Propene to 2,3-Dimethylbutane

(iii) But-1-yne to trans-2-Butene (2,2,2)

(b) Predict the products of the following reactions :

(i) 

(ii) 

(iii) 

(2,2,2)

4. Write short notes on any **four** of the following :

(a) Aromaticity

(b) Structure and stability of Carbocations

(c) Acidity of Alkynes

(d) Mechanism of Halogenation of Alkanes

(e) Absolute and Relative Configuration (3×4)

SECTION B

5. Answer the following briefly :

(a) What do you mean by normalisation and orthogonality of a wave function ?

(b) Why is the melting point of NaCl higher than that of $AlCl_3$?

(c) Which is more covalent CaF_2 or $CaCl_2$ and why ?

(d) Why does 2p orbital exist, but 2d does not ?

(e) Why is the dipole moment of NH_3 greater than that of NF_3 ?

(f) Why are lattice energy values and electron affinity values negative whereas ionisation energy, $\Delta H_{sublimation}$ and $\Delta H_{dissociation}$ positive ?

(2,2,2,2,2.5,3)

6. (a) Draw and explain the MO Diagram for NO^+ molecule. (3)

(b) Define lattice energy. State the Born-Lande equation for calculation of lattice energy. Define the terms involved. (3)

(c) Describe the Born-Haber cycle for calculating lattice energy in the formation of NaCl (s). (3)

(d) Draw the resonance structures of O_3 and NO_2 ? (3)

7. (a) What is the minimum uncertainty in the velocity of a bullet weighing 0.02 Kg whose position is known with $\pm 1 \times 10^5$ m accuracy. (3)

(b) The solutions to the Schrodinger wave equation which are possible must have four special properties. What are these ? (3)

(c) Write the expression for Schrodinger wave equation in Cartesian Coordinates. (3)

(d) Show how the LCAO approximation gives rise to bonding and antibonding orbitals. What orbitals are formed by the lateral overlap of p orbitals ? (3)

8. (a) What are the differences between the VBT and MOT ? (3)

(b) Explain Hund's rule. Explain the arrangement of electrons in Cu atom. (3)

(c) Draw and explain the structure of I_3^- according to VSEPR theory. (3)

(d) Draw the radial distribution function curves for 2s, 2p and 3s orbitals of H-atom. (3)