[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 6801 **D** **Your Roll No.....**

Unique Paper Code : 217161

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

Name of the Paper : CHPT-101 : CHEMISTRY – I

Semester : I

Time : 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 any **Three** questions from **Section-A** and **Section-B** respectively.

SECTION – A

1. (a) What is Schrodinger's wave equation ? Discuss its applicability for the simplest one-electron quantum system (Hydrogen atom) explaining the terms involved.

   (b) Write the values of three quantum number's n, m and 1 for electron in 4f and 3d orbitals.

   (c) Explain why s orbital's are spherical.

   (d) Plot the radial distribution curves for 3p, 3d orbitals.

   (e) Why are half-filled and fully filled orbital systems more stable ?

   (3,3,1½,3,2)

2. (a) $BeCl_2$ has zero dipole moment while H_2S has some value.

   (b) Calculate the % ionic character of Si-H bond in SiH4. Pauling electronegativity of Si and H are 1.4 and 2.1, respectively.

P.T.O.

(c) Write Born lande's equation for calculating lattice energy explaining all the terms in it.

(d) Which cation will exert a greater polarizing power in the following cases ? Explain.

(i) Na^+ or Mg^{2+} (ii) Cu^{2+} or Ca^{2+}

(e) NaCl is ionic while NaI is predominantly covalent. (2½,2½,2½,3,2)

3. (a) Predict the geometrical shape of the following molecules :

SF_6, $POCl_3$, I_3^-, BrF_5

(b) ClO_3^- and ClO_4^- ions have the same number of electron pairs around chlorine atom but their geometry is different why ?

(c) Draw the M. O. diagram for CO molecule and predict the magnetic behaviour.

(d) Explain the concept of Resonance. (4,3,3,2.5)

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

(i) Lattice energy

(ii) Heisenberg Uncertainty principal

(iii) Hydration Energy

(iv) Dipole moment

(v) VSEPR Theory (3,3,3,3,3½)

SECTION – B

5. Attempt any **five** of the following :

(i) Giving reasons arrange the following carbanions in increasing order of stability :

CH_3^-, $(CH_3)_3C^-$, $CH_3CH_2^-$, $(CH_3)_2CH^-$

(ii) Explain stability of benzyl carbocation.

(iii) Arrange the following in increasing order of acidic strength with suitable explanation

$Cl\text{-}CH_2COOH$, $HCOOH$, CH_3COOH

(iv) Out of CH_3OCH_3 and CH_3CH_2OH which one has higher boiling point and why ?

(v) Classify the following as electrophiles and nucleophiles :

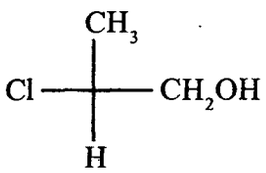
Br^+, H_2O, NO_2^+, $:CH_2$, NH_2^-

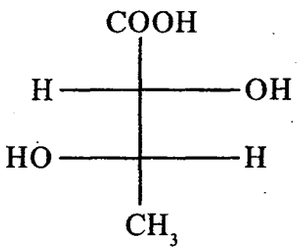
(vi) Out of ethylamine and aniline which one is more basic and why ? (2½×5)

6. (i) Draw Newmann Projection for different conformations of n-butane. Which of the conformation is most stable and why ? (5)

(ii) Write structure of 2-bromo-3-chlorobutane and indicate the number of stereoisomers possible for this compound. (1½)

(iii) Giving priority order, assign R-/ S- configuration to following :





(6)

7. (i) Methane and chlorine react in presence of light to give chloromethane. Give mechanism for this reaction. (3)

(ii) Complete the following reactions.

(a) $CH_3CH{=}CH_2 + HBr \xrightarrow{\text{Peroxide}}$

(b) $CH_3{-}CH_2{-}CH_2{-}CH_2{-}Cl \xrightarrow{\text{alc. KOH}}$

(c) $CH_3{-}CH{=}CH_2 \xrightarrow{KMnO_4}$ (1½x3)

P.T.O.

(iii) Write short note on any **two** of the following :

(a) Kolbe's reaction

(b) Wurtz reaction

(c) Hydroboration-oxidation in alkene

(d) Brich reduction (5)

8. (i) How will you distinguish pent-1-yne and pent-2-yne ? (1½)

(ii) Explain, which of the following are aromatic in nature :

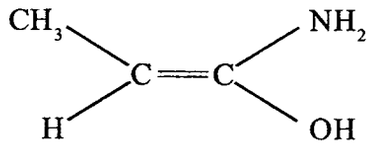
(a) Cyclopropenyl cation

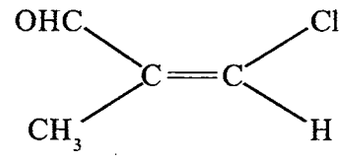
(b) Cyclobutadiene

(c) Benzene

(d) Cyclopentadienyl anion (1½×4)

(iii) Giving priority order assign E-/Z- to following :





(3)

(iv) Write the reaction and name the product (s) formed when but-2-ene is treated with ozone following by treatment with Zn/H_2O. (2)