(b) Explain when two wavefunctions are considered as normalised and orthogonal. Explain whether $\psi = x$ is normalised or not and why.

(c) Explain why

(i) p- nitrophenol has higher boiling point than o-nitrophenol.

(ii) CaI_2 is more covalent than CaF_2. (5+5+5)

6. Write short note on **any three** :

(a) Heisenberg's Uncertainty Principal

(b) Einstein Photoelectric Effect

(c) Solubility of Ionic Compounds

(d) Line spectra of Hydrogen atom

(e) Difference between orbit and orbitals (5+5+5)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3313 **I**

Unique Paper Code : 2174001001

Name of the Paper : Atomic Structure and Chemical Bonding

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

Semester : I / III / V

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions out of **six**.
3. **All** questions carry equal marks.

1. (a) Derive Time independent Schrodinger wave equation. Explain various terms involved in it.

(b) Give any two Postulates of Bohr's Model. What are the limitations of his proposed model.

(c) Calculate the momentum of a moving particle which has de-Broglie wavelength of 300pm. Derive the equation given by de-Broglie for Dual nature of particle and wave. (5+5+5)

2. (a) Discuss Born Lande's equation for estimating the Lattice Energy taking any suitable example.

(b) Calculate the heat of formation of ionic solid Neon Monochloride Ne^+Cl^- and indicate whether this hypothetical solid is favoured or not. Given

U_O = -840 KJ mol^{-1}; $D(Cl_2)$ = 226 KJ mol^{-1}; I_O = 2080 KJ mol^{-1}; $E(Cl^-)$ = –351 KJ mol^{-1}

(c) Explain the characteristic properties of ionic compounds. Explain with justification why $BaSO_4$ is insoluble in Water. (5+5+5)

3. (a) Differentiate between ψ and ψ^2. Give the conditions required to consider ψ as acceptable wavefunction.

(b) Explain whether the given wavefunctions are acceptable or not and why. **(any two)**

(i) ψ = Sin x

(ii) ψ = tan x

(iii) ψ = x

(c) Give the graphical representations of 1s, 2s, 2p orbitals. Give various quantum number values of these orbitals and number of nodes present in each. (5+5+5)

4. (a) Draw the shapes of any two out of three molecules on the basis of VSEPR theory and their hybridisation.

(i) H_2O

(ii) NH_3

(iii) PCl_5

(b) Draw the molecular orbital diagram for N^2 molecule.

(c) Explain the concept of Resonance. Draw various resonating structures of Benzene. (5+5+5)

5. (a) Write any two Fajan's Rule. Calculate Radius Ratio and determine the coordination number of the NaCl.

Given r_{Na^+} = 116; r_{Cl^-} = 167.