5. (a) Give the number of radial nodes and nodal planes for the following orbitals

4s, 3d, 5p, 2p

(b) Which of the following has more covalent character and why?

(i) NaCl and CuCl

(ii) AgCl and AgI

(c) Draw the resonating structures of carbonate ion and acetate ion.

(d) Draw the shape of d- orbitals. (4,4,4,3)

6. (a) Write the electronic configuration of elements with atomic number: 18, 24, 29, 46

(b) Which among the following will have higher melting point:

(i) SnO or LiCl, (ii) BaO or NaCl

(c) Arrange the following in terms of increasing order of their thermal stability.

$BeCO_3$, $MgCO_3$, $CaCO_3$, $SrCO_3$, and $BaCO_3$

(d) Comment on the shape and dipole moment of CCl_4 and $CHCl_3$. (4,4,4,3)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1231 **D**

Unique Paper Code : 2174001001

Name of the Paper : GE1 : Atomic Structure and Chemical Bonding

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

Semester : I

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. **All** questions carry equal marks.
3. Attempt any **FOUR** questions in all.
4. Use of scientific calculator is allowed.

1. (a) Write any four postulates of molecular orbital theory.

(b) Draw radial probability distribution curves for 3s, 3p and 3d orbitals on the same scale.

(c) In BF_3 and NH_3 which molecule will have zero value of dipole moment. Explain.

(d) Give the possible value of quantum numbers for an electron in 3d and 5p orbitals. (4,4,4,3)

2. (a) What are the boundary conditions to be fulfilled by the acceptable solution of the Schrodinger wave equation?

(b) Arrange CH_4, NH_3 and H_2O in terms of increasing order of their bond angle. Explain the order.

(c) Write the equation for theoretical calculation of lattice energy of an ionic crystal. Explain the terms involved in it.

(d) Draw the Molecular Orbital diagram of B_2^+ ion and compare its bond order with that of B_2 molecule. (4,4,4,3)

3. (a) Give the hybridization and shape of the given molecules

BF_3, PF_5, SF_4, IF_5

(b) Arrange the following in terms of increasing order of their melting points and explain the order $BeCl_2$, $MgCl_2$, $CaCl_2$, $SrCl_2$ and $BaCl_2$.

(c) The O_2 molecule is paramagnetic. Explain it on the basis of molecular orbital diagram.

(d) Calculate the % ionic character in HF molecule if the observed dipole moment is 6.6×10^{-30} Cm, bond length is 91.7 pm and charge on H atom is 1.602×10^{-19}C. (4,4,4,3)

4. (a) Melting points of CuCl and NaCl are 442°C and 800°C respectively. Justify.

(b) Write time independent Schrodinger wave equation for an atom and explain the terms involved in it.

(c) Draw Born Haber cycle and Calculate heat of formation of KF molecule from the following data:

(A) Heat of sublimation of potassium = 87.8 KJ/mol

(B) Dissociation energy of fluorine =158.9 KJ/mol

(C) Ionization energy of potassium = 414.2 KJ/mol

(D) Electron affinity of fluorine = –334.7 KJ/mol

(E) Lattice Energy of Potassium fluoride (KF) = –807.5 KJ/mol

(d) If the uncertainty in the position of an electron is 4Å°, what will be the uncertainty in its velocity? (4,4,4,3)

P.T.O.