

Set B.

S . No. of QuestionPaper: _____

Name of Course : B. Sc (Hons.) Chemistry

Semester : I

Name of the Paper : Inorganic Chemistry-I

Unique Paper Code : 32171101

Medium of setting the Question paper : English

Duration : 3 hrs

Max Marks: 75

1. (i) Draw the radial probability distribution curves for 4s, 4p and 4d orbitals. On the basis of these plots, explain their shielding effect and penetration power.
(ii) The acceptable solutions to the wave equation must have some special properties. What are these ?
(iii) Write the Schrodinger wave equation for an electron in H- atom and explain the various terms involved.
(iv) Which of the following subshells are permissible and why ?
3d, 5g, 6h, 2d
(v) Electronic configuration of Cu is $3d^{10}4s^1$ and not $3d^94s^2$. Explain. (4,4,4,4,2.75)
- 2.(i) Draw Born-Haber Cycle and calculate the enthalpy of formation (ΔH_f) of MgF_2 , using following data :
Sublimation Enthalpy of Mg = $146.4 \text{ kJ mol}^{-1}$
Ionization Enthalpy of Mg(g) to $Mg^{2+}(g)$ = $2184.0 \text{ kJ mol}^{-1}$
Dissociation Enthalpy of F_2 = $158.9 \text{ kJ mol}^{-1}$
Electron gain enthalpy of F(g) = $- 334.7 \text{ kJ mol}^{-1}$
Lattice Enthalpy of MgF_2 = $- 2922.5 \text{ kJ mol}^{-1}$
(ii) What is the need of converting cartesian coordinates into polar coordinates ? Illustrate the relationship between polar coordinates and the cartesian coordinates.
(iii) What is Pauli's Exclusion Principle? On its basis calculate the number of electrons in M shell.
(iv) Explain, which one of the following pairs has higher ionization enthalpy :
Be and B ; (b) Cu and K
(v) Explain the terms orthogonal and normalize wave function? (4,4,4,4,2.75)
- 3(i) Calculate the percentage ionic character in Cs – F bond in CsF molecule. The electronegativity values for Cs and F are 0.7 and 4.0 respectively. Predict the nature of CsF molecule
(ii) The second ionization enthalpy of Mg is almost double of the first and the formation of O^{2-} is endothermic, nevertheless we formulate magnesium oxide as $Mg^{2+}O^{2-}$. Explain.
(iii) Using VSEPR Theory, predict the shapes of the following species : I_3^- , SF_4 , ClF_3 , PCl_6
(iv) Explain the formation of covalent bond in hydrogen molecule, using Heitler London approach.

(v) The dipole moment of NF_3 is much less than that of NH_3 though both have same structure. Explain. (4,4,4,4,2.75)

- 4.(i) Define Bent's Rule . How does it help to decide the bond angles of PCl_3F_2 ?
(ii) Using Molecular Orbital Theory, arrange the following species in increasing order of their bond length: O_2^+ , O_2 , O_2^- .
(iii) What is resonance energy ? Write resonating structures for CO_2 and NO_3^- .
(iv) Calculate the limiting radius ratio values for the ionic compounds when the coordination number is 3 and 6.
(v) Which has greater dipole moment CO_2 or SO_2 . Give reason (4,4,4,4,2.75)

5. (i) Draw Molecular Orbital diagram of CO molecule (using s-p mixing). On the basis of this diagram, explain how CO is an electron pair donor through carbon atom.
(ii) Explain how Bands theory accounts for electric conduction of Mg metal.
(iii) Calculate the electronegativity of bromine. (Atomic number of Br = 35 , covalent radius of Br = 1.14 Å).
(iv) With the help of the structure, explain the type of hybridization in NO_2 and NO_2^+ . Also give their respective bond angle values.
(v) Explain the Significance of Ψ and Ψ^2 (4,4,4,4,2.75)

- 6 (i) Why the electro negativity of fluorine is higher than that of chlorine, but the electron gain enthalpy of chlorine is higher ?
(ii) Arrange the following in increases order of their solubility in water : NaF, NaCl, NaBr, NaI and justify.
(iii) Write short notes on the followings :
(a) Non equivalence in hybrid orbitals
(b) Fajan's rule
(iv) Calculate the ionic radii of the Na^+ and F^- ions, if the internuclear distance between these ions is 231pm
(v) ZnCl_2 is soluble in organic solvent while MgCl_2 is insoluble . Explain (4,4,4,4,2.75)