KNT/KW/16/5045

Bachelor of Science (B.Sc.) Semester—I (C.B.S.) Examination
CHEMISTRY (Inorganic Chemistry)
Compulsory Paper—1 (CH-101)

Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) All **FIVE** questions are compulsory and carry equal marks.
(2) Write equations and draw diagrams wherever necessary.

1. (a) Define quantum numbers. Explain the significance of principal and azimuthal quantum numbers. Find the values of 'n' and '*l*' for 3p electron. 5

   (b) Define and discuss the trends of the following in periodic table :
   (i) Atomic and ionic radii and
   (ii) Electron affinity. 5

OR

   (c) State and explain Hund's rule of maximum multiplicity. 2½

   (d) Discuss Heisenberg uncertainty principle. 2½

   (e) Calculate effective nuclear charge for 4s electron of Calcium (Z of Calcium = 20). 2½

   (f) What is ionization potential ? Discuss any two factors affecting it. 2½

2. (a) What are the postulates of VBT ? Explain the formation of hydrogen molecule with potential energy diagram using VBT. 5

   (b) (i) Define :
   (1) Polarization of cation and
   (2) Polarizability of anion.
   (ii) Explain the shape of H_2O molecule using VSEPR theory. 5

OR

   (c) What is Hybridization ? Explain sp^2 hybridization with suitable example. 2½

   (d) How does overlap criteria explain the bond strength ? 2½

   (e) What is Lattice Energy ? Calculate lattice energy of KCl from the following data :
   (i) Heat of formation of KCl = – 435.96 kJ mol^{-1}.
   (ii) Ionization of K = 415 kJ mol^{-1}.
   (iii) Dissociation of Cl_2 = 241.34 kJ mol^{-1}.
   (iv) Electron affinity of Cl = –365.26 kJ mol^{-1}.
   (v) Sublimation energy of K = 87.8 kJ mol^{-1}. 2½

   (f) Write the limitation of Valence bond theory. 2½

3. (a) Discuss the comparative study of s-block elements with respect to :
   (i) Reducing property and
   (ii) Ionization potential. 5

   (b) (i) Write electronic configuration of IA group elements.
   (ii) Draw and discuss the structure of XeF_4. 5

OR

   (c) What is hydrogen bond ? Discuss different types of hydrogen bonding with examples. 2½

   (d) What is diagonal relationship ? Discuss diagonal relationship between Li and Mg. 2½

   (e) What is the effect of hydrogen bonding on :
   (i) Boiling and melting point and
   (ii) Viscosity ? 2½

   (f) Discuss the structure and bonding in $XeOF_2$. 2½

4. (a) What is boranes ? Discuss structure and bonding of diborane. 5

   (b) Give the comparative account of p-block elements with respect to :
   (i) Electronegativity and
   (ii) Oxidation states. 5

OR

   (c) Discuss structure and bonding in borazine. 2½

   (d) Give one method of preparation of Caro's acid. Discuss structure and bonding in it. 2½

   (e) Discuss diagonal relationship between B and Si. 2½

   (f) Draw and discuss the structure of P_2O_3. 2½

5. Answer any **TEN** of the following :
   (i) Draw the shape of dz^2 orbital.
   (ii) Write Schrödinger wave equation for hydrogen atom.
   (iii) Why is cation smaller and anion larger in size than the corresponding atom ?
   (iv) Find the number of bp's and lp's in SF_4.
   (v) Mention the type of hybridization in PCl_5 and IF_7.
   (vi) Explain why AgCl is more covalent than NaCl.
   (vii) What is hybridization in XeF_6 molecule ?
   (viii) Draw the structure of $XeOF_4$ molecule.
   (ix) Explain why H_2O is liquid at room temperature.
   (x) Draw the structure of P_2O_5 molecule.
   (xi) How is Marshall's acid prepared from Chlorosulphonic acid ?
   (xii) Draw the structure of H_3PO_2. 1×10=10