

This question paper contains 4 printed pages]

Your Roll No.

5774

B.Sc. (H) CHEMISTRY/III Sem.

B

Paper—CHHT-305

INORGANIC CHEMISTRY

(Admission of 2010 and onwards)

Time : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Do any five questions.

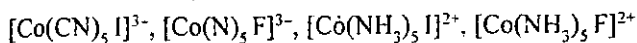
All questions carry equal marks.

1. (a) Compare and contrast the Valence Bond Theory and the Molecular Orbital Theory. 4
- (b) With the help of Molecular Orbital Theory which of the following species is paramagnetic in nature and which are dia-magnetic in nature : 5
- O_2^+ , O_2 , O_2^- , O_2^{2-} and NO^+
- (c) Explain on the basis of Molecular Orbital Theory which of the following species will have identical Bond orders : 3
- O_2^- , NO^+ and N_2

P.T.O.

(d) What are the conditions for hybridization ? Give the characteristics of hybrid orbitals. 3

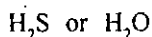
2. (a) Which of the following complexes are stable ? Explain on the basis of HSAB principle : 4



(b) On the basis of VSEPR theory predict the shapes of the following molecules : 6



(c) Which out of the two will have a shorter bond angle and give reason for your answer : 5



3. (a) Predict the shape of PCl_5 and explain why the equatorial and axial bond lengths in PCl_5 are not equal ? 5

(b) If X, Y and Z represents elements of atomic numbers 9, 17 and 55 respectively, predict the type of bonding you would expect to occur between (a) X and Y, (b) X and Z, (c) Y and Z. Predict giving reasons the volatility, electrical conductance and solubility in water of the compounds thus formed. 10

4. (a) What is a conjugate acid base pair ? Explain with suitable examples that a strong acid will always have a weak conjugate base and a weak acid has a strong conjugate base. 5
- (b) Bond energy of a single covalent bond is approximately 200 kJ Mole^{-1} . But the bond energy of H-H single bond is 458 kJ Mole^{-1} . Explain. 4
- (c) Explain why CuCl and AgCl are insoluble in H_2O and NaCl is soluble in H_2O . 6
5. Give reasons for the following :
- (a) Draw possible resonating structures of azide union N_3^- . How do they differ from those of hydrozoic acid HN_3 ? 5
- (b) AgI_2^- complex is stable but AgF_2^- is unstable. 3
- (c) CsF reacts with LiI even though both are ionic in nature. 3
- (d) BF_3 combines with F^- and not with H^- . 4
6. Write short notes on :
- (a) The Band Model of Metals. 5
- (b) London Forces. 2
- (c) Hydrogen Bonding. 3
- (d) Defects in ionic solids. 5

7. (a) Drive Born Lande's expression to calculate the Lattice Energy of ionic crystal. 7

(b) Draw Born Haber cycle and calculate lattice energy of sodium chloride from the following data : 8

Heat of sublimation of sodium = 10.5 kJ mol^{-1}

Dissociation energy of Cl_2 = $243.0 \text{ kJ mol}^{-1}$

Ionization energy of Na = $495.2 \text{ kJ mol}^{-1}$

Electron affinity of chlorine = $-348.3 \text{ kJ mol}^{-1}$

Enthalpy of formation of NaCl = $-381.8 \text{ kJ mol}^{-1}$