[This question paper contains 4 printed pages.]

Sr. No. of Question Paper: 731 G Your Roll No......

Unique Paper Code : 217301

Name of the Paper : CHHT-305 (Inorganic Chemistry – II)

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

Semester : III

Duration: 3 Hours Maximum Marks: 75

Instructions for Candidates

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

2. Attempt five questions in all. Question No. 1 is compulsory.

3. All questions carry equal marks.

1. Attempt any five of the following giving reasons:

- (a) Which is more covalent: CuCl or NaCl?
- (b) Which has greater dipole moment: CO₂ or SO₂?
- (c) CsF reacts with LiH, even though both are ionic in nature.
- (d) H₂O is a liquid whereas H₂S is a gas.
- (e) Predict whether the following reaction will take place or not?

$$BeF_2 + HgI_2 \rightarrow$$

(f) Despite the fact that ionic compounds are hard, they are brittle too.

 (3×5)

- 2. (a) Draw Born-Haber cycle for the formation of solid Al₂O₃. (4)
 - (b) Calculate lattice energy of MgO (in kJmol⁻¹).

Given:
$$A = 1.7475$$
, $r(Mg^{2+}) = 0.65 A^{\circ}$, $r(O^{2-}) = 1.40 A^{\circ}$,
 $n = 7$, $e = 4.8 \times 10^{-10} \text{ esu}$ (4)

- (c) Derive limiting radius ratio for an ionic crystalline compound with coordination number 4 (Tetrahedral). (4)
- (d) Which is more soluble in water: NaCl or CsCl? Give reason. (3)
- 3. (a) Discuss the molecular orbital diagram of HCl molecule. (3)
 - (b) Which is more ionic: PbO or PbO₂? Why? (3)
 - (c) Compare Valence Bond Theory and Molecular Orbital Theory. (3)
 - (d) Discuss the geometry and shape of the following molecules / ions on the basis of VSEPR theory. (Any three)

$$XeO_3$$
, SF_4 , ClO_4^- , ClF_3 (2×3)

- 4. (a) What is Bent's rule? Explain the structure of PCl₃F₂ on the basis of Bent's rule. (4)
 - (b) Draw resonating structures of the following species:

$$HN_3, CO_3^{2-}$$
 (4)

(c) What is doping? Why it is done in semiconductors? (4)

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(d) Discuss the magnetic properties of the following species:

$$O_{2}, O_{2}, O_{3}$$
 (3)

- 5. (a) Explain whether B, molecule is paramagnetic or diamagnetic. (4)
 - (b) Arrange the chlorides of alkali metals in increasing order of hardness. Give reason. (4)
 - (c) What is Hydrogen bonding? Explain the different types of hydrogen bonds giving suitable examples. (4)
 - (d) Calculate % ionic character of HX molecule.

Given, dipole moment of HX = 1.92 D,

bond distance,
$$H - X = 1.2 \text{ A}^{\circ}$$
, $e = 4.8 \times 10^{-10} \text{ esu}$ (3)

6. (a) Arrange the following in increasing order of acidic strength, giving reasons:

- (b) Which has greater melting point: o-nitrophenol or p-nitrophenol?

 Why?

 (4)
- (c) Which is a weaker base: 2-methylpyridine or pyridine? Why? (4)
- (d) Explain Symbiosis with the help of suitable examples. (3)
- 7. Write short notes on the following: (Any three)
 - (a) Stoichiometric defects in solids

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- (b) Resonance and resonance energy
- (c) Band theory

(d) Solvation energy

(5×3)

(400)