

2. (a) Draw Born-Haber cycle for the formation of solid Al_2O_3 . (4)

(b) Calculate lattice energy of MgO (in kJmol^{-1}).

Given: $A = 1.7475$, $r(\text{Mg}^{2+}) = 0.65 \text{ \AA}$, $r(\text{O}^{2-}) = 1.40 \text{ \AA}$,

$$n = 7, e = 4.8 \times 10^{-10} \text{ esu} \quad (4)$$

(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 PbO_2 ? 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)



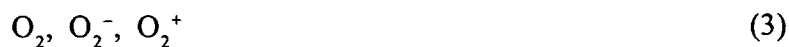
4. (a) What is Bent's rule ? Explain the structure of PCl_3F_2 on the basis of Bent's rule. (4)

(b) Draw resonating structures of the following species :



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

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



5. (a) Explain whether B_2 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,

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

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

(b) Resonance and resonance energy

(c) Band theory

(d) Solvation energy

(5×3)