RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous Degree College with P.G. Section under University of Calcutta)

B.A./B.SC. SECOND SEMESTER EXAMINATION, MAY 2011

FIRST YEAR

Date : 23/05/2011 **CHEMISTRY (Honours)**

Time : 11 am – 12.30 pm Paper : IIB Full Marks : 25

Group – C

Unit – I

[Answer <u>any three</u> questions]

1. a) The cyanate ion, $OCN^{\ominus}$ forms a stable series of salts while the isomeric fulminate ion, $CNO^{\ominus}$ forms a few salts which are often explosive— explain. [3]
   b) Why ZnO shows different colour in hot condition— Explain. [2]

2. a) Explain the bond angle sequence in the following molecules PF_3, PCl_3, PBr_3 and PI_3. [3]
   b) Applying Bent's rule discuss the shape and hybridisation of ClF_3. [2]

3. a) Write down and explain the ^{19}F N.M.R studies of PF_3. [3]
   b) Why p-dihydroxy benzene is polar while p-dimethylbenzene is non polar? [2]

4. In a series of molecules PXH_2 the HPH bond angle was 90°, 95° and 100°. What hybridisation of phosphorous 's' and 'p' orbitals is implied in each case? Calculate the percent 's' and 'p' characters of the hybrid orbital of phosphorous in each case. [2+3]

5. Calculate the Lattice energy of cuprous bromide (CuBr) in KJ mol^{-1} using the Born-Lande' equation taking Madelung constant as 1·638. Born exponent as 9·5 and equilibrium distance as 246 pm. Then calculate Lattice energy of the compound using the following thermochemical data. [2+2+1]

Heat of atomisation of copper (s)	=	339
First ionisation energy of copper	=	745
Heat of atomisation of bromine (ℓ)	=	112
Electron affinity of bromine	=	–342
Heat of formation of cuprous bromide (s)	=	–105

   (all in KJ mol^{-1})

   Comment on the difference between the two Lattice energy values.

   [permittivity of vacuum, $\varepsilon_0 = 8{\cdot}854 \times 10^{-12} c^2 m^{-1} J^{-1}$]

Unit – II

[Answer <u>any two</u> questions]

6. a) Au forms Au^- but Cu does not. Justify. [3]
   b) Why anhydrous beryllium chloride can not be prepared by heating the hydrated salt? [2]

7. a) The black silver oxide having the empirical formula AgO is diamagnetic— Explain [2]
   b) 'Beryllium sulphate is moderately soluble and beryllium oxide is virtually insoluble in water However, the solubilities of both the compounds are increased when both are present in the same solution'— Justify the statement. [3]

8. a) The observed trend of solubility in water are LiF < NaF < KF < CsF but LiI > NaI > KI > CsI— Explain. [3]
   b) Lithium does not form a solid bicarbonate— Explain. [2]