RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR

B.A./B.SC. FIRST SEMESTER (July – December), 2012

Mid-Semester Examination, September 2012

Date : 11/09/2012 **CHEMISTRY (General)**

Time : 11 am – 12 noon Paper : I Full Marks : 25

[*Answer **any one** question from each unit*]

Unit – I

1. a) Calculate—
   i) Wave length of the lowest energy transition in Balmer series of the hydrogen spectrum.
   ii) Radius of hydrogen atom in the ground state.
   iii) Ionisation energy of hydrogen atom. [3×2]
   b) What is quantum number? Write the significance of magnetic quantum number. [1+2]
   c) What would be the size of Ne^{9+} ion according to the Bohr model. [2]
   d) What do you mean by diagonal relationship? Why is diagonal relationship arises between two elements? [2]

2. a) Write the IUPAC name of the elements with atomic number 101 and 110. [2]
   b) Why is atomic radii of the same period elements decreases from left to right? —Explain [2]
   c) Write the difference of electron affinity and electronegativity of an element. [2]
   d) Between fluorine and chlorine whose electron affinity is greater than the other. Explain the reason. [2½]
   e) Comment on the 1st and 2nd electron affinity of oxygen. [2]
   f) Write and explain the position of noble gases in the periodic table. [2½]

Unit – II

3. a) What do you mean by radius ratio? State the basis of radius ratio rule for ionic compound. [1+2]
   b) Frame the Born-Hober cycle for the formation of NaCl crystal starting from sodium metal and chlorine (g) and hence calculate the lattice energy of crystalline sodium chloride using the following data. [1+2]

Heat of sublimation of metallic sodium	=	108 KJ/mole
Bond dissociation energy of chlorine	=	240 KJ/mole
Ionisation energy of sodium (g)	=	495 KJ/mole
Electron affinity of chlorine	=	359 KJ/mole
Heat of formation of solid NaCl	=	410 KJ/mole

   c) Using VSEPR theory determine the central atom hybridisation and shape of the following species. XeF_4, $POCl_3$, BrF_4^- and I_3^- [1½×4]

4. a) Ionic bonding is nondirectional. —Explain. [2]
   b) Hardness of MgO is greater than NaCl. —Justify. [2]
   c) Write the information obtained from the radius ratio rule and its limitations. [3]
   d) Write down the Born-Lande equation and the different term symbols in the equation. [2]

e) Establish the Born-Haber cycle for the formation of $MgBr_2$ from the element and calculate its Lattice energy from the following data (in KJ mol^{-1}) [3]

Heat of sublimation of Mg(s) = 148
Electron affinity of bromine (g) = 331
Heat of vaporisation of bromine (ℓ) = 31
Ionisation energy of Mg ($I_I + I_{II}$) = 2187
Dissociation energy of Br_2(g) = 193
Heat of formation of $MgBr_2$ (s) = 524