RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIRST SEMESTER EXAMINATION, DECEMBER 2013

FIRST YEAR

Date : 19/12/2013 **CHEMISTRY (General)**

Time : 11 am – 1 pm Paper : I Full Marks : 25

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

Unit - I

1. a) What is nuclear binding energy? Show its variation with increase of atomic number. [3]
   b) Calculate the nuclear binding energy per nucleon of C^{12} from the following data :
   C = 12·00000, n = 1·00893, p = 1·00758 and d = 0·0005 amu. [3]
   c) Calculate the Pauling electronegativity (χ) of iodine in IF from the following data :
   $E_{I-I} = 149\,KJmol^{-1}$, $E_{F-F} = 155\,KJmol^{-1}$, $E_{I-F} = 278\,KJmol^{-1}$, $\chi_F = 4{\cdot}0$. [3]
   d) Write the electronic configuration of the atom having atomic number 23 and hence predict the position of the atom in the modern long periodic table. [2]
   e) Why nuclear fusion is known as thermonuclear reaction? [2]

2. a) The time taken for disintegration of 90% ^{18}F atoms is 356 min. Calculate the half life of ^{18}F. [3]
   b) Predict the variation of electron affinity of the following elements with reason :
   Na, Mg, Al, Si, P, S, Cl, Ar [2]
   c) Write the IUPAC names of the elements having atomic number 106 and 111. [2]
   d) Calculate the ionisation energy of a hydrogen atom, given R = 109700 cm^{-1}. [2]
   e) Explain the significance of magnetic quantum number. [2]
   f) What is nuclear fission reaction? Give example. [2]

Unit - II

3. a) Calculate the minimum value of r_+/r_- required to attain coordination number eight. [2]
   b) Why s-orbitals fail to give π-bonding? [2]
   c) Suggest the hybridisation of the central atom of the following molecules or ions : [2]
   NH_4^+, SF_4, XeF_4, BF_4^-
   d) Calculate the lattice energy of Magnesium Sulphide using the following data (all in KCal/mole) :
   $\Delta H_f(Mgs) = -82{\cdot}2$; $\Delta H_{Sub}(Mg) = -36{\cdot}5$; $IP_1 + IP_2 = 520{\cdot}6$; $\Delta H(S\text{-atom}) = 133{\cdot}2$;
   $EA_1 + EA_2 = -72{\cdot}4$ [2]
   e) Write IUPAC nomenclature of the following compounds :
   i) $K_3[Fe(CN)_5CO]$ ii) $[Co(en)_2(NO_2)_2]Cl$ [1+1]
   f) Dipolemoment of NH_3 is greater than NF_3. — explain. [2]

4. a) Draw the Born-Haber cycle for the formation of the $MgBr_2$ crystal from elemental magnesium and bromine. [2]
   b) Bond angle in H_2O is 105° and in H_2S it is 92°, —Justify the differences in bond angles. [2]
   c) $MgSO_4$ is water soluble while $BaSO_4$ is water insoluble, explain with reasons. [2]
   d) Using VSEPR model, predict the structures of the following species : ClF_3, ICl_4^-. [2]
   e) HF has an acid salt KHF_2 though it is a monobasic acid. —Explain. [2]
   f) Why Si-Cl bond in $SiCl_4$ is stronger than C-Cl bond in CCl_4? [2]