RAMAKRISHNA MISSION VIDYAMANDIRA
(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIRST SEMESTER EXAMINATION, DECEMBER 2012
FIRST YEAR
Date   : 15/12/2012   **CHEMISTRY (Honours)**
Time   : 10.30 am – 11.30 am   Paper : I (Gr. C)   Full Marks : 25

Group – C

UNIT-I
(*Answer **any one** question*)

1. a) Which one of the two nuclides, ^7Li and ^7Be, would be more stable and why? How would the less stable one decay to the more stable one?   1+2+1

    b) The skull of a prehistoric-man gives 3.2 counts/min/g of Carbon, while a living man gives 80 counts/min in 5g. How long ago did the man live? [Given $t_{1/2}$ ^{14}C = 5700 yrs].   3

    c) Find out the ground state Term symbol for Co^{2+}.   2

    d) Calculate the energy for the reaction: $^{18}F(\beta^+)^{18}O$.
    [Given: Masses of ^{18}F = 18.00095u, ^{18}O = 17.99916u, m_e = 0.00055u].   2

    e) Explain the exchange energy with respect to the electronic configuration of copper.   2

2. a) Calculate the binding energy per nucleon of ^{55}Mn.
    [Given: Mn = 1.008665u, m_p = 1.007277u, m_e = 0.00055u, and isotopic mass of ^{55}Mn = 54.938054u].   2

    b) What do you mean by "Fissile nucleus"? Give one examples of such nuclei.   2

    c) Show that de-Broglies hypothesis is applicable only for microscopic particles but not for macroscopic particles.   3

    d) What are magic numbers?   2

    e) What is 'Radial Probability Function'? Draw the radial probability function curves for 3s, 3p and 3d orbitals. Give significance of each curve.   1+3

UNIT-II
(*Answer **any one** question*)

3. a) The electron affinity of Chlorine is 3.7 eV. How much energy in Kcal is released when 2g of Chlorine is completely converted to Cl^- ion in the gaseous state?   3

    b) Discuss Pauling's method for the determination of univalent radii.   3

    c) Calculate the Alred-Rochow electronegativity of bromine (Given: ^{d}Br–Br = 2.28 $\overset{\circ}{A}$)   2

    d) Give reasons:
      i) Electron affinity of N is almost zero while that of F is very high.
      ii) Ionisation energies of C, N and O follow the order: C < N > O.   2+2

4. a) PbI_4 is non-existant whereas $PbCl_2$ is a stable compound – Why?   2

    b) Explain (**any three**):   2x3
      i) The atomic radii of Zr and Hf are almost identical.
      ii) The electronegativity of Ga (1.82) is greater than Al (1.47) although Ga is placed below Al in group 13.
      iii) $MgCO_3$ is thermally less stable than $CaCO_3$.
      iv) The stability of Hg_2^{2+}, Cd_2^{2+} and Zn_2^{2+} differs significantly.

    c) What do you mean by 'Lanthanide contraction'? Give its consequences in chemistry.   2+2

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