RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIRST SEMESTER EXAMINATION, DECEMBER 2011

FIRST YEAR

Date : 16/12/2011 **CHEMISTRY (Honours)**

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

Group – C

Answer **any one** from each Unit

Unit–I

9. a) State and explain Pauli Exclusion Principle. 2

   b) Calculate the velocity of hydrogen electron in the second Bohr orbit. 2

   c) Show the radial probability distribution function diagram of 3s, 3p, 3d orbitals in a hydrogen atom. Explain the diagram. 3

   d) How many millilitres of radon under standard conditions of temperature and pressure are in equilibrium with 1 gram of radium? (Given $t_{1/2}(Rn) = 3.82$ days, $t_{1/2}(Ra) = 1590$ years, Atomic weight of Ra = 226). 3

   e) What would be the size of a Ne^{9+} ion according to Bohr model? 2

   f) Calculate the weight in grams of one Curie of 14_C ($t_{½}$ = 5000 yrs). 3

10. a) Discuss the characteristics of nuclear forces. How does the meson theory of exchange force explain the nuclear stability. 1+3

    b) Determine the possible states for the elements $_8O$ and $_{20}Ca$ give the term symbols and choose the ground state. 2+2

    c) When $^{50}_{24}Cr$ is bombarded with α particles, two nuclear reactions occur in which neutrons and deuterons are observed respectively as products. Establish nuclear reactions showing the formation of possible other product nuclides. 2

    d) What is radiocarbon dating? 1

    e) Find out the relationship between mass defect and nuclear binding energy. Draw the nuclear binding energy curve. What informations are available from the curve. 1+1+2

Unit – II

11. a) Give reasonable explanations of the following facts:

    (i) First ionisation potentials of coinage metals fall in the order Cu > Ag < Au.

    (ii) Electron affinity of SF_5 is among the highest known but that of SF_6 is quite modest. 2+2

    b) Interatomic distance in chlorine is 1.98 $\mathring{A}$. Calculate the Allred-Rochow electronegativity of chlorine atom using Slater's rules. 3

    c) Explain group electronegativity with suitable examples. 2

    d) Write the valence shell electronic configuration of the element with atomic number 61 and give the symbol. 1

12. a) What do you mean by lanthanide contraction. 2

    b) Write the IUPAC name of the elements with atomic number 109 and 105. Give their symbols. 2

    c) Why the first ionisation potential of copper is greater than that of potassium. 2

    d) The first ionisation energizes and electron affinities of the atoms Ca, Cl, Cr and Cs are (not in order) given below:

	3.89	6.11	6.76	13.01
EA	–1.62	0.47	0.66	3.61

(all in ev units)

Assign the ionisation energy and electron affinity values to each element. Explain your assignment. 4