EASTERN UNIVERSITY, SRI LANKA

FIRST YEAR FIRST SEMESTER EXAMINATION IN SCIENCE-2010/2011

(NOVEMBER 2012)

CH 101 PERIODICITY AND BONDING

Answer all questions   Time: 01 hour

Plank's constant (h) = 6.63×10^{-34} Js, Velocity of light(C) = 3×10^{8} ms^{-1}, Mass of electron = 9.11×10^{-31} kg, $\varepsilon_o = 8.854 \times 10^{12}$ C^{2}N^{2}m^{-2}, e = 1.602×10^{-19} C

1. (a) A student wants to demonstrate the photoelectric effect by using a disk of zinc placed on an electroscope. The work function of zinc is 6.9×10^{-19} J.

   (i) Define the terms work function & photoelectric effect.

   (ii) Calculate the maximum wavelength of light that will eject electrons from the Zinc.

   (iii) Calculate the maximum kinetic energy of an electron emitted from the zinc disk when the wavelength of the light is 260 nm.

   (30 marks)

   (b) Explain why is the emission spectrum of hydrogen a line spectrum and not a continuous spectrum?

   (20 marks)

   (c) Calculate the energy of the states of the hydrogen atom with n=2 and n=3 and the wave length of a photon when an electron makes a transition between these states.

   (30 marks)

   (d) Explain the following with suitable example.
      i)   Dual nature of electron
      ii)   Pauli's Exclusion Principle

   (20 marks)

2. (a) Use the VSEPR model to predict the shape of the following molecules

(i) Fluoromethane

(ii) Sulfur hexafluoride

(20 marks)

(b) Draw the molecular orbital diagrams for Li_2^+ and C_2 molecules separately and determine the following properties of these two molecules.

    i)   Molecular orbital configurations

    ii)   Bond order

    iii)   Magnetic character

(40 marks)

(c) What is the total number of orbitals associated with the principal quantum number 3?

(10 marks)

(d) What is the hybridisation of the atom B in BF_3? Explain by using the orbital diagrams.

(30 marks)