EASTERN UNIVERSITY, SRI LANKA

FIRST YEAR FIRST SEMESTER EXAMINATION IN SCIENCE-2011/2012

(Feb/March' 2014)

CH 101 PERIODICITY AND BONDING

Answer all questions **Time: one hour**

Plank's constant (h) =6.63×10^{-34} Js, Velocity of light(C) = 3×10^{8} ms^{-1}, Mass of electron=9.1×10^{-31} kg,
$\varepsilon_o = 8.854 \times 10^{12}$ $C^2N^2m^{-2}$, e = 1.602×10^{-19} C

1. Answer all the parts

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

(ii) A metal plate is irradiated with electromagnetic radiation of wavelength 200 nm. The metal has a work function of 7.57 x 10-19 J. Show by calculation that the metal plate will emit photo-electrons when irradiated with radiation of this wavelength.

(iii) The intensity of the incident radiation on the metal plate is increased whilst maintaining a constant wavelength of 200 nm. State and explain what effect this change has on the following:

I. Energy of the emitted photo-electrons

II. Number of emitted photo-electrons

(40 marks)

(b) i). What are the postulates of Bohr theory?

ii). Identify the symbols in the following equation for Bohr theory

$$\frac{1}{\lambda} = R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

iii) Calculate the ionization energy ($kjmol^{-1}$) of hydrogen atom using the following equation for Bohr theory

$$E = E_i - E_f = R_E\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

where R_E= 2.178 X 10-18 J

(30 marks)

Contd...

(c) Calculate the energy of the states of the hydrogen atom with n=3 and n=4 and the wave length of a photon when an electron makes a transition between these states.

(10 marks)

(d) Write short notes on the following

i) Dual nature of electron

ii) Photoelectric effect

(20 marks)

2. Answer all the parts

(a) Draw the molecular orbital energy level diagram for HCl and briefly explain the bonding of HCl

(10 marks)

(b) Predict whether the bond length of N_2^+ is shorter of longer than that of N_2 using molecular orbital theory.

(10 marks)

(c) What are the orbitals associated with the principal quantum number $n = 3$?

(10 marks)

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

(20 marks)

(e) i) What is meant by VSPER theory?

(20 marks)

ii) write the Lewis structure of the following molecules and predict the shapes of the molecules using VSEPR theory.

I. H_2O II. PCl_5 III. NH_3

(30 marks)
