# Eastern University, Sri Lanka
## First Year First Semester Examination in Science-2009/2010
## (May/July 2012)
## External Degree
## EXTCH 101 Periodicity and Bonding
## (Repeat)

**Answer all questions** **Time: 01 hour**

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

1. The work function for lithium is $4.6 \times 10^{-19}$ J.

   (a) Calculate the threshold frequency of light that will cause photoelectric emission.

   (b) What is the maximum energy of the electrons emitted when light of $7.3 \times 10^{14}$ Hz is used?

   (40 marks)

   (c) Derive an equation for the Bohr radius of the hydrogen atom and calculate its radius.

   (30 marks)

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

   (30 marks)

2. (a) Explain the following with an example in each case.
   - i) Resonance
   - ii) Photo electric effect
   - iii) Pauli's Exclusion Principle

   (30 marks)

   (b) Write the four quantum numbers for each of eight electrons in oxygen atom in the ground state.

   (10 marks)

   (c) Draw the molecular orbital energy level diagram for $N_2^+$ and $He^{2+}$ molecules and determine the following properties of these two molecules.
   - i) Molecular orbital configurations
   - ii) Bond order
   - iii) Magnetic character
   - iv) Compare the bond length and bond strength

   (50 marks)

   (d) Predict the shapes of the following molecules using VSEPR theory.

   i) $CCl_4$ ii) $PCl_5$

   (10 marks)

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