EASTERN UNIVERSITY, SRI LANKA

FIRST YEAR FIRST SEMESTER EXAMINATION IN SCIENCE-2016/2017

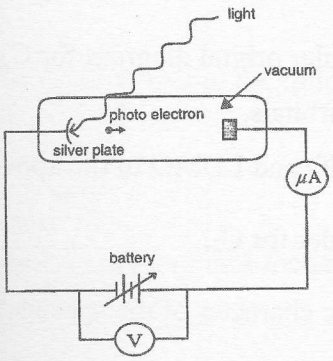
(AUGUST/SEPTEMBER-2018)

CH 101-PERIODICITY AND BONDING-Old Syllabus

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, 1eV = 1.6×10^{-19} J

1. The apparatus shown below was set up to investigate the photoelectric effect.



Using this apparatus, it is found that light of wavelength 254 nm ejects photoelectrons from a silver plate. The work function of the silver surface is 4.7 eV.

a) *Define* the terms 'work function' and 'photoelectric effect'.

(20 marks)

b) *Calculate* the energy, in eV, of a single photon of light of wavelength 254 nm.

(20 marks)

c) *Calculate* the kinetic energy, in eV, of the fastest moving photoelectrons ejected by light of 254 nm?

(20 marks)

d) *What* does the Heisenberg Uncertainty Principle say about electrons?

(20 marks)

e) *What* is the Planck's quantum theory of radiation?

(20 marks)

Cont.

2. a) *List* out the postulates of Bohr theory?

(2

b) *Sketch* the combination of atomic orbitals that produces the lowest-energy sigma orbital of $BeCl_2$ using the Linear Combination of Atomic Orbitals Molecular Orbitals (LCAO-MO) correlation Diagrams.

(2

c) Using a Molecular orbital energy level diagram, *describe* the bonding in HCl a *down* the electron configuration of its valence electrons.

(2

d) *What* are the orbitals associated with the principal quantum number $n = 3$?

(2

e) i) *Draw* a valence molecular orbital diagram for C_2. Your diagram must include atomic and molecular orbitals.

ii) Clearly *label* the HOMO and LUMO in the above orbital diagram for C_2

iii) *Calculate* the bond order for C_2.

iv) *Compare* the Magnetic character of the species; C_2, C_2^+ and C_2^-

(2

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