EASTERN UNIVERSITY, SRI LANKA
SECOND SEMESTER THIRD EXAMINATION IN SCIENCE
2007/2008 (December 2008)
SPECIAL REPEAT
CH 304 QUANTUM CHEMISTRY AND INDUSTRIAL CHEMISTRY & METALLURGY

Time: One hour

Answer all questions.

The use of non-programmable calculator is permitted

Planck's constant (h) = 6.626 x 10^{-34} Js, Rest mass of electron (m_e) = 9.1 x 10^{-31} kg

Electron charge (e) = 1.602 x 10^{-19} C,

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a) i) Derive the de Broglie equation and identify the terms involved in it.

(15 marks)

ii) If the kinetic energy of the particle having mass 'm' is E, show that $P = \sqrt{2mE}$ where P is the momentum of the particle.

(10 marks)

iii) Calculate the de Broglie wave length of the electron in the ground state of the Hydrogen atom with kinetic energy of 13.6 eV.

(20 marks)

b) i) Write down the time independent Schrodinger equation for a particle moving in a one – dimensional box and identify the terms in it.

(10 marks)

ii) The wave function 'ψ' of the particle is given by $\psi = \left(\frac{2}{a}\right)^{1/2} \sin\left(\frac{\pi x}{a}\right)$.

Determine the probability of the particle which restricted to move in a one – dimensional box of length 'a' is found to be the distance between 0 and $a/2$.

(30 marks)

c) Determine the degeneracy of the energy level $\frac{17h^2}{8ma^2}$ of a particle in a cubical box

(15 marks)

Cont..

2. a) Metals can be extracted from their ores through several processes. Give a short account on refining of metals (physical and chemical methods).

(35 marks)

b) Briefly explain the dry process of manufacture of Portland cement.

(40 marks)

c) Briefly explain the important steps in Glass forming process.

(25 marks)