



EASTERN UNIVERSITY, SRI LANKA
THIRD EXAMINATION IN SCIENCE – 2003/2004
SECOND SEMESTER
(June/July-2005)
CH 304 QUANTUM CHEMISTRY AND INDUSTRIAL
CHEMISTRY

Time: 01 Hour

Planck constant $h = 6.626 \times 10^{-34} \text{ Js}$, Mass of an electron $m_e = 9.1 \times 10^{-31} \text{ kg}$
Charge of an electron $= 1.602 \times 10^{-19} \text{ C}$, $1 \text{ eV} = 1.6019 \times 10^{-19} \text{ J}$

1. a) Normalise the function $\cos(n\pi x/a)$ over the interval $-a < x < a$.
 - b) Write down the Schrodinger equation for one-dimensional system and identify all the terms in it.
 - c) Using the Schordinger equation derive expressions for the wave function and energy levels of a particle of mass m moving in a two-dimensional box of lengths a and b assuming that the potential energy is zero inside the box and infinity outside the box.
 - d) If the six π -electrons of benzene are regarded as free to move in a two dimensional box (square) of length a , estimate the energy of the first electronic excitation.
2. (a) Out line the raw materials used in the production of portland cement and discuss the dry process of manufacture of portland cement indicating the important step.
 - (b) Describe, briefly a method each to determine SiO_2 , Fe_2O_3 , CaO and MgO in cement.

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