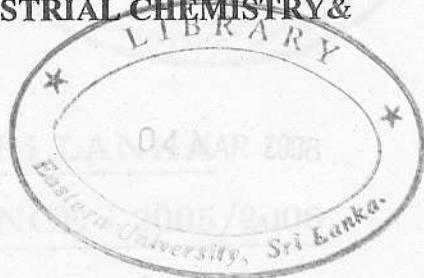


EASTERN UNIVERSITY, SRI LANKA
THIRD EXAMINATION IN SCIENCE (SECOND SEMESTER)
SPECIAL-REPEAT 2004/2005

CH 304: QUANTUM CHEMISTRY AND INDUSTRIAL CHEMISTRY &
METALLURGY

TIME: 01 HOUR



- (1) (a) For a particle of mass 'm' moving in a one-dimensional box of length 'a' the potential energy (V) is constant inside the box and infinity outside the box.
- (i) Write the Schrodinger equation for a particle moving in a one-dimensional box and identify the terms in it.
 - (ii) Write expression for energy for the particle.
 - (iii) If $a = 1.5 \text{ nm}$, calculate the minimum energy of the particle.

- (b) Three wave functions Ψ_1 , Ψ_2 and Ψ_3 are degenerate Eigen functions of the Hamiltonian operator H and orthonormal. The linear combination of these three wave functions is given by $\Psi = a\Psi_1 + b\Psi_2 + c\Psi_3$ (a, b and c are arbitrary constants). Show that,

$$a^2 + b^2 + c^2 = 1$$

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

- (2) a) Briefly describe, using examples, the four methods that are widely used to concentrate ores.
- b) Write a descriptive account of the common process involved in the manufacture of ceramic.

.....