



Eastern University, Sri Lanka

Third Year Second Semester Examination in Science-2009/2010

(March 2013)

CH 304 Quantum Chemistry, Metallurgy and Industrial Chemistry

(Special Repeat)

Answer all questions

Time: 01 hour

- 1) (a) i. Metals can be extracted from their ores through several processes. Give a short account on refining of metals using the chemical methods.

(40 marks)

- (b) i. What is Ellingham diagram?

- ii Aluminum is used for extraction of metals, such as chromium from their respective oxides. What is the principal reason for using this metal (Al) as the reducing agent?

Explain using the information given below.



Briefly explain the dry process of manufacture of Portland cement.

(40 Marks)

- (c) Explain briefly the hydration of Portland cement.

(20 Marks)

Contd...

2) (a) i. Write the general expression for the energy level of a particle moving in a cubical box and identify all the terms in it.

ii. Find the lowest energy of an electron in a rectangular box dimensions

$1 \times 10^{-13}$  cm,  $1.5 \times 10^{-13}$  cm and  $2 \times 10^{-13}$  cm.

(40 Marks)

b) The molecules  $H_2C = CH - (CH = CH)_2 - CH = CH_2$  considered as successively longer one-dimensional box for electron. If it is assumed each C-C and C=C bond lengths to be  $1.5 \text{ \AA}$  and the end C-H bonds are neglected, what is the wavelength of absorption of the lowest transition.

(40 Marks)

c) The wave function of a particle is given by  $\Psi = \sqrt{2/a} \sin\left(\frac{n\pi x}{a}\right)$ . Determine the probability of the particle which is restricted to move in a one-dimensional box of length 'a' is found to be the distance between 0 and  $a/2$ .

(20 Marks)