EASTERN UNIVERSITY, SRI LANKA

SECOND YEAR SECOND SEMESTER EXAMINATION IN SCIENCE-2013/2014

(OCTOBER/NOVEMBER 2016)

CH 206 X-Ray Crystallography, Symmetry & Symmetry elements and Phase rule

(PROPER)

Answer all questions **Time allowed: ONE Hour**

Avogadro's No. is 6.022×10^{23} (mol-1)

1. a) List the symmetry elements present in the following molecules? (Marks will be deducted for wrong symmetry elements)

   i) $POCl_5$ ii) chlorobenzene iii) 1,3,5 tribromobenzene iv) CO_2

   (20 marks)

   b) Write the Miller indices for the plane having following intercepts and draw a schematic diagram to show the planes in the unit cell.

   i) a, b/2, c ii) a /2, b/2, c ii) a, 2b, c

   (30 marks)

   c) At 278K, iron (Fe) is found to show body centered cubic (bcc) structure with a lattice parameter of 0.2866nm. Calculate the density of iron.

   (20 marks)

   d) A powder diffraction photograph of a cubic crystal gave Brag's diffraction as shown below when λ of the radiation used is 1.54×10^{-10} m. Values of $\sin^2\theta$ for all reflections are listed below. Determine the length and type of the unit cell.

   $\sin^2\theta$: 0.0371, 0.0742, 0.111, 0.148, 0.185, 0.222, 0.297

   (30 marks)

Contd…

2. a) State the phase rule and identify the terms in it.

(10 m

b) A saturated solution of KCl with excess of the solid is present at equilibrium in container.

i) Find out the number of components and phases present.

ii) What is the degree of freedom of the system?

iii) Identify the dependent and independent variables

(30

c) Draw the phase diagrams of binary liquid mixtures (partially miscible) and exp you would separate the components.

(30

d) Benzene and toluene form an ideal solution. At 298K, what is the mole f benzene in the liquid that is in equilibrium with a vapor that has equal partial of benzene and toluene? At 298K, the vapor pressures of pure benzene and pu are 95 and 28 torr, respectively.

(30 m

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