EASTERN UNIVERSITY, SRI LANKA SECOND EXAMINATION IN SCIENCE (2003/2004) EXTERNAL DEGREE

SECOND SEMESTER (Oct./Nov. 2007)

EXTCH 206 X-RAY CRYSTALLOGRAPHY, SYMMETRY, SYMMETRY ELEMENTS AND PHASE RULE

ANSWER ALL QUESTIONS T	IME – ONE HOUR
1. a) What are the symmetry elements present in the following mole	ecules?
i) C ₆ H ₆ ii) H ₂ O iii) C ₂ H ₄ iv) PtCl ₄ ²	(20 marks)
b) i) What are the Miller indices for the planes having the following cubic cell?	lowing intercepts in a
I) a, b, c II) \propto a, b, \propto c III) a/2, b, c/2	(20 marks)
ii) Draw a schematic diagram for each of the above planes.	(20 marks)
c) A powder diffraction photograph of the element Polonic following values of 2 θ (in degrees) when 71.0 pm Mo X- 21.0, 24.3, 27.2 and 29.9. Identify the unit cell and determin	-rays used: 12.1, 17.1 e its dimensions.
	(40 marks)
2. a) State Gibb's phase rule and explain the terms in it.	(05 marks)
b) Explain the following terms	
(i) Phase ii) Degree of freedom	(10 marks)
c) Calculate the degree of freedom for the following	
(i) A mixture of nitrogen gas and oxygen gas in a vesse	el (10 marks)

Rhombic sulphur in equilibrium with monoclinic sulphur (10 marks)

(ii)

d) Is it possible to have a quadruple point in a phase diagram for one-component system?

(15 marks)

e) Liquids Q and R form an ideal solution at 50 $^{\circ}$ C. The total vapour pressure of a solution consisting of 'x' moles of Q and 'y' moles of R is p. On the addition of 'x' more moles of Q to the solution the total vapour pressure increases to 3P/2. Show that the vapour pressure of pure Q, P_Q° is given by

$$P_Q^0 = p(2 - [y/x])$$
 (25 marks)

(f) Components A and B form two solid empounds A₂B and AB₂. The compound A₂B melts at 850 °C to give a liquid having the same composition as that of A₂B. The compound AB₂ melts and decomposes at 750 °C to give solid B and a liquid containing 65 % of B. The melting points of A and B are 600 °C and 1100 °C respectively. Sketch a phase diagram of temperature versus amount of fraction of the system and completely label it.

(25 marks)

muser of the or the line involver when to be of the

and the first state of the stat

. N. Kenti Marikani isan