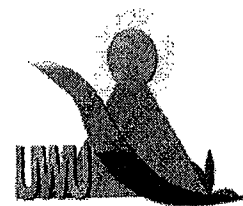


Uva Wellassa University, Sri Lanka  
End Semester Examination – March 2011  
CHE 481-1 Phase Transformation (Repeat)



Time: Two (02) hours

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Total two (02) questions

Answer all questions

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Universal gas constant,  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$

Boltzmann constant,  $k = 1.3807 \times 10^{-23} \text{ J K}^{-1}$

Planck's constant,  $h = 6.626 \times 10^{-34} \text{ m}^2 \text{ kg s}^{-1}$

Avogadro constant,  $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$

Faraday's constant,  $F = 9.6485 \times 10^4 \text{ C mol}^{-1}$

Velocity of light,  $c = 2.998 \times 10^8 \text{ m s}^{-1}$

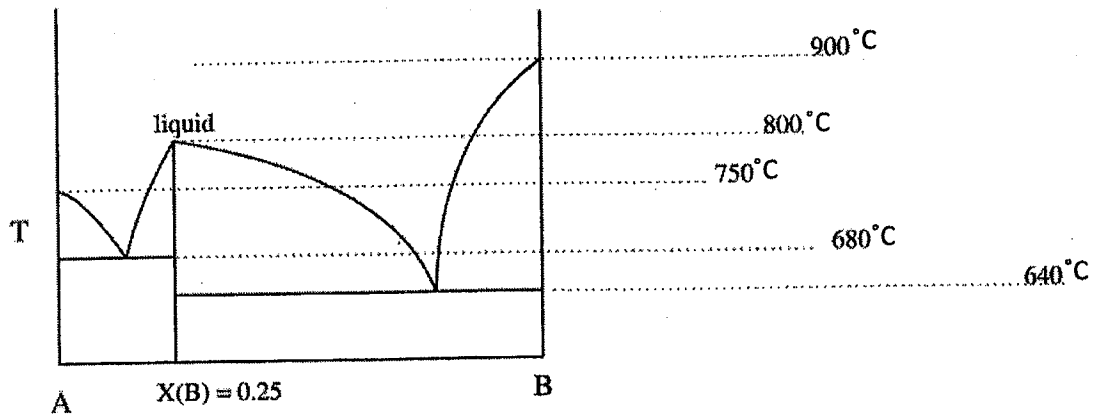
01. a. A hypothetical compound **P** has following properties.

- Its boiling point is 300°C.
- Its melting point is 100°C.
- Solid **P** is denser than liquid **P**.
- The triple point of **P** is 90°C.

- i. Sketch the phase diagram of **P**.
- ii. Label the regions of the phase diagram.

(25 marks)

b. Use the following phase diagram in Fig. Q01b to answer following questions.

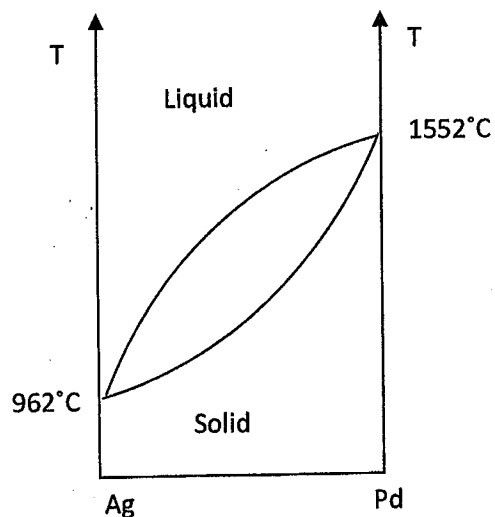


*Fig. Q01b*

- Label all the phases present in each regions.
- What is the melting point of A?
- What is the melting point of B?
- Write the formula of any compound formed.
- Are any eutectics formed by these compounds? If so, estimate the composition and eutectic temperature.

(20 marks)

- c. A schematic representation of Ag-Pd alloy Phase diagram is as follows;



*Fig. Q01c*

Name each coexistence line and write the equilibrium it represents.

(05 marks)

02.

a. Construct and name the hypothetical phase diagram for metals A and B between room temperature (20 °C) and 700 °C given the following information:

- The melting temperature of metal A is 480 °C.
- The maximum solubility of B in A is 4 wt% B, which occurs at 420 °C.
- The solubility of B in A at room temperature is 0 wt% B.
- One eutectic occurs at 420 °C and 18 wt% B – 82 wt% A.
- A second eutectic occurs at 475 °C and 42 wt% B–58 wt% A.
- The intermetallic compound AB exists at a composition of 30 wt% B–70 wt% A, and melts congruently at 525 °C.
- The melting temperature of metal B is 600 °C.
- The maximum solubility of A in B is 13 wt% A, which occurs at 475 °C.
- The solubility of A in B at room temperature is 3 wt% A.

(25 marks)

b. If a compound containing 25 wt% B – 75 wt% A. is heated to 700 °C and then cooled to the room temperature gradually;

- i. At what temperature the first solid particle formed?
- ii. At what temperature the compound become a solid completely?
- iii. Draw microstructures that you expected to form during this solidification giving the ratios of A and B at each point of interest.

(25 marks)