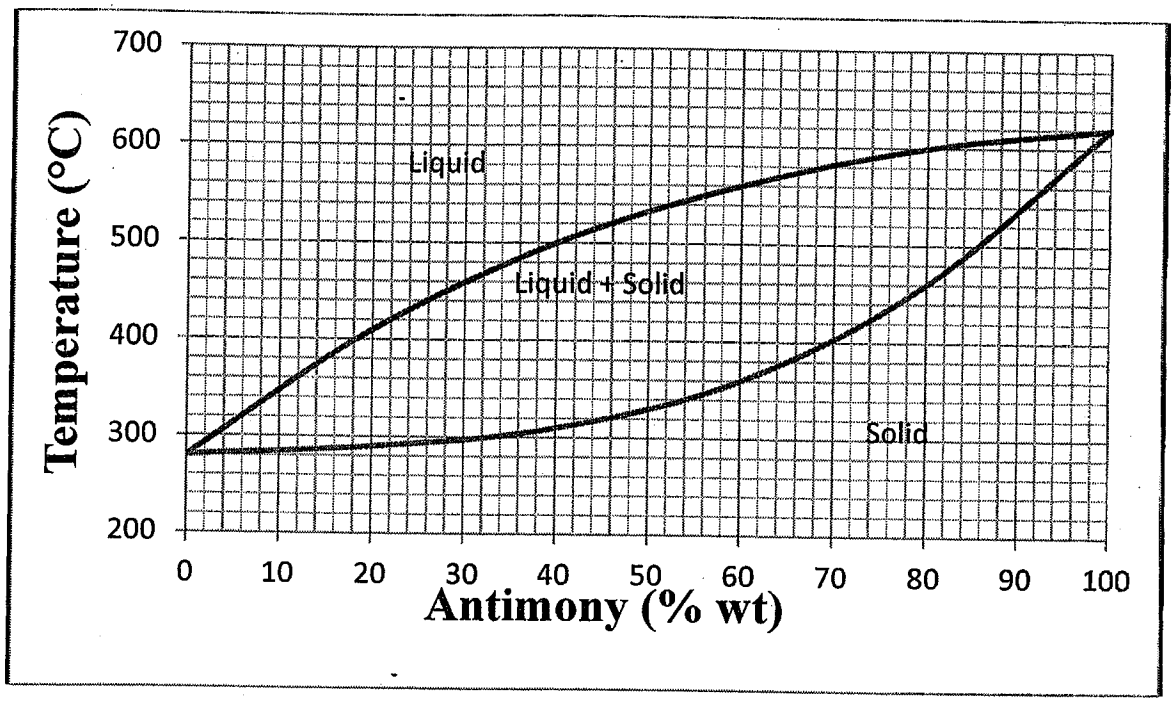
Uva Wellassa University of Sri Lanka
End Semester Examination – September/ October 2012
SCT 233 -1 Physical Chemistry

Time: One (01) hour

Total **two (02)** questions.
Answer **all** questions.

1) Following graph represents the Bismuth-Antimony thermal equilibrium phase diagram. Use the graph to answer question 1.



Would you expect the diagram to be of this type? Give reasons.

a. Consider an alloy containing 70% Sb – 30% Bi which is cooling slowly;

b.

i. At what temperature will solidification begin?
ii. What will be the composition of the first solid to form?
iii. What will be the composition of the phases present at 500°C?
iv. In what proportions by mass will the phases in (III) present?
v. What will be the composition of the last trace of liquid which solidifies?
vi. At that temperature will solidification be complete?

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c. State the phase rule and identify the terms there in.

d. Derive the phase rule for two- component system.

e. Write short accounts on **three** of the following

i. Simple distillation
ii. Immiscible liquids
iii. Azeotrope
iv. Critical solution temperatures

(50 marks

2) a. State Kohlrausch's law and identify the terms there in.

b. Compare and contrast strong and weak electrolytes.

c. i. State law of the independent migration of ions and identify the terms there in.

ii. Calculate a limiting molar conductivity of Na_2SO_4, when the Limiting ionic conductivities of Na^+ and SO_4^{2-} are 5.01 λ /(mS m^2 mol^{-1}) and 16.00 λ /(mS m^2 mol^{-1}) in water at 298 K respectively.

d. Calculate the cell potential with the Nernst equation for the following half reactions.

$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O \quad E^\circ = 1.51$ V

$Zn^{2+} + 2e^- \longrightarrow Zn \quad E^\circ = -0.76$ V

When, $T = 25^\circ$ C

$[MnO_4^-] = 2.5$ M

$[H^+] = 0.75$ M

$[Mn^{2+}] = 1.0 \times 10^{-3}$ M

$[Zn^{2+}] = 1.0 \times 10^{-2}$ M

e. How many grams of Cl_2 can be produced from aqueous KCl in 2 hours with a current of 30 A? (96485 C = 1 Faraday)

(50 marks)

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