

Uva Wellassa University, Sri Lanka
End Semester Examination – August 2011
SCT 234-2 Advanced Chemistry (Repeat)



Time: Two (02) hours

Total three (03) questions
Answer all questions

Universal gas constant, $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$
Boltzmann constant, $k = 1.3807 \times 10^{-23} \text{ J K}^{-1}$
Plank'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, $c = 2.998 \times 10^8 \text{ m s}^{-1}$

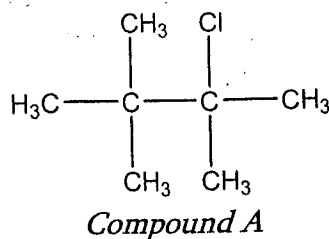
Part - A

01. a. Write the IUPAC names of the following compounds
- $\text{K}_3[\text{Fe}(\text{CN})_6]$
 - $[\text{Zn}(\text{en})_2]\text{Br}_2$
 - $[\text{Mn}(\text{I})_3(\text{H}_2\text{O})_3]^-$
- (20 marks)
- b. Write the formula for the following coordination complexes
- pentaamminehydroxocobalt(III) chloride
 - magnesium diaquabis(oxalato)vanadate(III)
 - hexaamminechromium(III) tetrachlorocuprate(II)
- (20 marks)
- c. Draw figures that represent all of the geometric isomers and name the type of isomer for the following compounds. If there is only one possible, draw only one.
- $[\text{Cd}(\text{en})\text{Cl}_2]$ (square planar)
 - $[\text{Cr}(\text{NH}_3)_4(\text{OH})\text{Cl}]^+$
- (40 marks)
- d. Which complex is most likely to be a low spin complex? explain
 $[\text{Co}(\text{en})_3]^{3+}$ or $[\text{Co}(\text{en})_2\text{Br}_2]^+$
- (20 marks)

Part - B

02. Answer either part a or b

a.



- i. Sketch the $^1\text{H-NMR}$ spectrum of the *Compound A* showing the distance from TMS, relative areas (integration) and multiplicity of the signals.
- ii. Draw the $^{13}\text{C-NMR}$ for the *Compound A*

(100 marks)

- b. Deduce the Structure of *Compound B* ($\text{C}_6\text{H}_{12}\text{O}$) having the following spectral data. IR $\nu_{\text{max}} 1715 \text{ cm}^{-1}$; $^1\text{H-NMR}$ 2.35 (t,2H), 2.02(s,3H), 1.54 (m,2H), 1.24 (m,2H), 0.75 (t,3H); MS m/z 85, 58 and 43

(100 marks)

Part - C

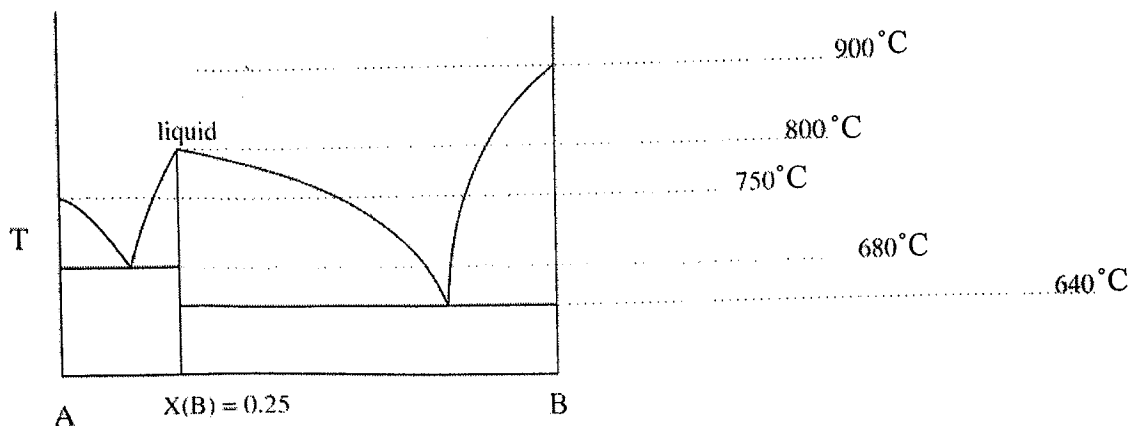
03. a. A hypothetical compound *P* has following properties.

- 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)

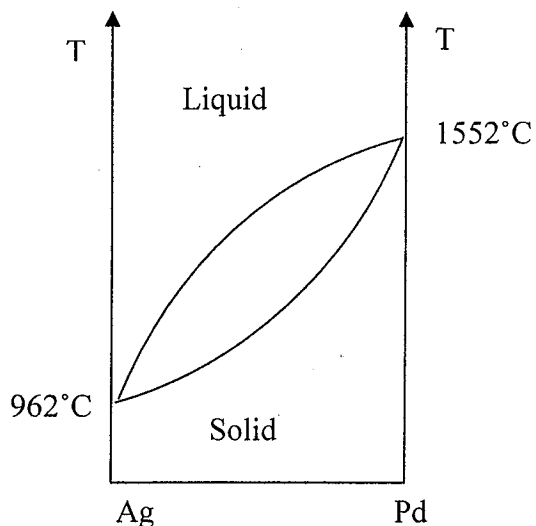
b. Use the following phase diagram to answer following questions.



- i. Label all the phases present in each regions.
- ii. What is the melting point of A?
- iii. What is the melting point of B?
- iv. Write the formula of any compound formed.
- v. 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;



- i. Name each coexistence line and write the equilibrium it represents.
 - ii. With reference to the phase diagram explain how you purify 50:50 Ag – Pd alloy.
- (55 marks)