

B.Sc. - II (CBCS Pattern) Sem-III  
**USCCHT06 - Chemistry Paper-II (Physical Chemistry)**

P. Pages : 2

Time : Three Hours



**GUG/W/23/11601 (S)**

Max. Marks : 50

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- Notes : 1. All **Five** questions are compulsory and carry equal marks.  
2. Draw Diagram wherever necessary.  
3. Use of calculator is permitted.

1. a) Draw the phase diagram for lead-silver system. Discuss the application of phase rule to this system. 5  
b) Discuss phenol-water system of partially miscible liquids. Explain the effect of impurities on critical solution temperature. 5

**OR**

- c) State phase Rule. Explain the meaning of terms involved in it. 2½  
d) Discuss partial miscibility of nicotine - water system. 2½  
e) Discuss minimum boiling azeotropes of ethanol-water system. 2½  
f) Explain deviation of Nernst Distribution law when solute undergoes dissociation in one of the solvents. 2½
2. a) Derive an equation for entropy change for an ideal gas in term of Pressure (P) & Temperature (T). 5  
Calculate the entropy change when 2 moles of an ideal gas is allowed to expand at 300K from pressure of 10 atm to 2 atm.  
b) Derive an integrated form of Van't Hoff reaction isochore. 5

**OR**

- c) What are the needs for second law of thermodynamics? 2½  
d) Derive Gibb's – Helmholtz equation. 2½  
e) Derive the relation between standard free energy change and equilibrium constant. 2½  
f) State & Explain chemical potential. 2½
3. a) What is first order reaction? Derive an expression for rate constant of first order reactions. Show that half life period of first order reaction is independent of initial concentration. 5  
b) Derive expression for rate constant based on equilibrium constant and thermodynamic aspects. 5

**OR**

- c) Discuss effect of temperature on rate of reaction. 2½

- d) The rate constant of reaction is  $2.5 \times 10^{-4} \text{ sec}^{-1}$  at  $35^\circ\text{C}$  and  $3.9 \times 10^{-4} \text{ sec}^{-1}$  at  $45^\circ\text{C}$ . Calculate energy of activation of reaction ( $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ). 2½
- e) Discuss the characteristics of catalyzed reaction. 2½
- f) Write a note on enzyme catalysis. 2½
4. a) What is elevation of boiling point? Obtain an expression for molar mass of substance from elevation of boiling point. 5
- b) Discuss determination of magnetic susceptibility by using Gouy method. 5

**OR**

- c) Explain diamagnetism & paramagnetism with suitable examples. 2½
- d) State Raoult's Law of lowering of vapour pressure. How can it be used to determine the molecular weight of non-volatile solute in solution? 2½
- e) 0.440 gm of substance dissolved in 22.2 g of benzene lowered the freezing point of benzene by  $0.567^\circ\text{C}$ . Calculate the molar mass of substance. ( $K_f = 5.12^\circ\text{C mol}^{-1}$ ). 2½
- f) Define degree of association and obtain the relation between degree of association and Van't Hoff factor. 2½
5. Attempt **any Ten**. 1x10  
=10
- i) State Henry's law and give any one limitation.
- ii) Write Clausius-Clapeyron equation in its integrated form.
- iii) Define lower and upper consolute temperature.
- iv) Write any two statements of second law of thermodynamics.
- v) What do you mean by partial molar quantities?
- vi) Give significance of Helmholtz free energy.
- vii) What is zero order reaction?
- viii) Define.
- a) Molecularity of reaction
- b) Half life of a reaction
- ix) What is heterogeneous catalytic reaction?
- x) What do you mean by osmotic pressure?
- xi) What is Van't Hoff factor?
- xii) Calculate magnetic moment of  $\text{Mn}^{+2}$ .

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