

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

P. Pages : 2

Time : Three Hours



**GUG/W/24/11601(S)**

Max. Marks : 50

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- Notes :
1. All five questions are compulsory and carry equal marks.
  2. Draw diagram whenever necessary.
  3. Use of calculator is permitted.

1. a) Draw the phase diagram for water system. Discuss the application of phase rule to this system. 5

b) State and explain Nerst Distribution law. Discuss its applications and limitations. 5

**OR**

c) Give the derivations of phase rule. 2½

d) Discuss partial miscibility of nicotine-water system. 2½

e) Discuss minimum boiling azeotropes of ethanol-water system. 2½

f) Write a note on steam distillation. 2½

2. a) Derive an equation for entropy change for an ideal gas in term of Pressure (P) and Temperature (T). 5

Calculate the entropy change when 2 moles of an ideal gas is allowed to expand at 300 K from pressure of 10 atm to 2 atm.

b) i) Derive Gibb's – Helmholtz equation. 5

ii) State and explain chemical potential.

**OR**

c) What are needs for second law of thermodynamics? 2½

d) Discuss entropy as criteria of spontaneity. 2½

e) Derive relation between standard free energy change and equilibrium constant. 2½

f) Explain Helmholtz free energy and give its physical significance. 2½

3. a) What is second order reaction? Derive an expression for specific rate constant of second order reaction if initial concentration of both the reactants are equal. 5

b) Derive expression for rate constant based on equilibrium constant and thermodynamics aspects. 5

**OR**

- c) Discuss effect of temperature on rate of reaction. 2½
- d) The rate constant of a 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  $45^\circ \text{C}$ . 2½  
Calculate energy of activation of reaction ( $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$ ).
- e) Discuss the characteristics of catalysed 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) Explain diamagnetism and paramagnetism with suitable examples. 5  
Derive relation between magnetic moment and number of unpaired electrons.
- OR**
- c) What is osmotic pressure? How is it measured by Berkeley and Hartley's method. 2½
- d) 0.444 g of substance dissolved in 22.2 g of benzene, lowered the freezing point of benzene by  $0.56^\circ \text{C}$ . Calculate the molar mass of substance.  $\left[ K_f = 5.12^\circ \text{C mol}^{-1} \right]$  2½
- e) Discuss application of magnetic susceptibility measurement in the study of co-ordination compound. 2½
- f) Explain the term magnetic permeability and ferromagnetism. 2½
5. Attempt **any ten** (each carry one mark).
- i) State Raoult's law of ideal solution. 1
- ii) Define upper consolute temperature. 1
- iii) Define component and degree of freedom. 1
- iv) Give statement of second law of thermodynamics. 1
- v) Define standard free energy. 1
- vi) What is meant by partial molar quantities? 1
- vii) What is meant by Pseudo order reaction? 1
- viii) Define auto catalysis. 1
- ix) What is half life of a reaction? 1
- x) What is Vant Hoff factor? 1
- xi) Calculate magnetic moment of  $M_n^{2+}$ . 1
- xii) What is Bohr's magneton? 1

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