

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

P. Pages : 2

Time : Three Hours



GUG/W/22/11601

Max. Marks : 50

- Notes :
1. All **five** questions are compulsory and carry equal marks.
 2. Draw diagrams 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 Nernst distribution law. Discuss Nicotine-water system with suitable diagram. 5

OR

c) Derive Clausius-Clapeyron equation for liquid-vapour equilibrium. 2 ½

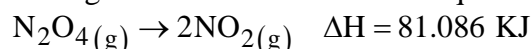
d) Define azeotropes? Describe the types of azeotropes with suitable examples. 2 ½

e) State and explain Henry's law. 2 ½

f) Discuss phenol-water system with suitable phase diagram. 2 ½

2. a) State the need for second law of thermodynamics. Derive an expression for entropy change for an ideal gas under isothermal process. 5

b) Derive integrated form of Vant Hoff's equation for reaction 5



If the equilibrium constant is 0.18 at 298 K. Calculate the equilibrium constant at 340K.
(R=8.314 Jk⁻¹mol⁻¹)

OR

c) Derive Gibbs-Helmholtz equation. 2 ½

d) Define Gibb's free energy and explain its physical significance. 2 ½

e) Discuss entropy as criteria of spontaneity and equilibrium. 2 ½

f) What are partial molar quantities? Write expression for chemical potential. 2 ½

3. a) Obtain an expression for specific rate constant of second order reaction if initial concentration of both the reactants species are equal. State the characteristics of second order reaction. 5

b) What are the characteristics of catalyst. Explain enzyme catalysis with suitable example. 5

OR

- c) State the postulate of transition state theory. 2 ½
- d) Show that the half life period of first order reaction is independent of initial concentration of reactant species. 2 ½
- e) The rate constant of reaction is $2.5 \times 10^{-4} \text{ sec}^{-1}$ at 35°C and $4.1 \times 10^{-4} \text{ sec}^{-1}$ at 50°C . Calculate energy of activation of reaction ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$) 2 ½
- f) Explain 2 ½
 i) Homogeneous and
 ii) Heterogeneous catalysis with suitable examples
4. a) Define colligative properties. Obtain an expression for molar mass determination of solute from elevation of boiling point. 5
- b) What is magnetic susceptibility? Describe Gouy's method for its measurement. How does it help in deciding the molecular structure of a substances. 5
- OR**
- c) How osmotic pressure is measured experimentally by Berkeley and Hartley's method. 2 ½
- d) Explain the terms 2 ½
 i) Diamagnetism and ii) Ferromagnetism with suitable examples.
- e) An aqueous solution containing 0.20 gm of solute dissolved in 20 gm of water froze at -0.50°C . Calculate molar mass of solute if enthalpy of fusion of ice at 0°C is 6025 J/mole . 2 ½
- f) Define Vant-Hoff's factor. Obtain the relationship between Vant-Hoff's factor and degree of dissociation. 2 ½
5. Attempt **any ten** each carry one mark. 10
- 1) What is eutectic mixture?
 - 2) State Raoult's law of ideal solution
 - 3) Define upper consolute temperature
 - 4) State any two statement of 2nd law thermodynamic
 - 5) Define work function.
 - 6) Write equation for relation between standard free energy change and equilibrium constant.
 - 7) What is first order reaction?
 - 8) Define energy of activation
 - 9) Define Autocatalysis
 - 10) Calculate the normality of solution, if 2g of NaOH is dissolved in 250 ml of solution.
 - 11) What is Cryoscopic constant?
 - 12) The number of unpaired electrons in O_2 molecules is two. Calculate magnetic moment.
