

B.Sc. CBCS Pattern Semester-III
USCCHT06 - Chemistry Paper-II : Physical Chemistry

P. Pages : 2

Time : Three Hours



GUG/W/23/11601

Max. Marks : 50

- Notes : 1. All **five** questions are compulsory and carry equal marks.
2. Write equations and draw diagrams wherever necessary.

1. a) Describe Sulphur system with the help of phase diagram. 5
b) State and explain Nernst Distribution Law. In the distribution of benzoic acid between water and benzene, the following results were obtained. 5

C_1 [in water]	1.50	1.95
C_2 [in Benzene]	24.2	41.2

Show that Benzoic acid exists as a dimer in Benzene.

OR

- c) Explain the term- 2½
i) Number of components ii) Degrees of freedom
d) Draw the phase diagrams of the systems with- 2½
i) Congruent melting points ii) With incongruent melting points
e) State Henry's Law and give its limitations. 2½
f) Write a note on steam distillation. 2½
2. a) Derive an expression for entropy change when an ideal gas expands from V_1 to V_2 at constant temperature. 5
Calculate entropy change when 2 moles of an ideal gas is heated from 40°C to 50°C at constant pressure. The molar heat capacity at constant pressure of the gas is 30.28 J deg⁻¹ in this temp. Range.
b) Explain 'chemical potential'. Derive Gibb's – Duhem equation. 5
OR
c) Explain the significance of work function [A]. 2½
d) Calculate free energy change when 4 moles of ideal gas expand from 10 atm to 1 atm at constant temperature of 298K. 2½
e) Derive Van't Hoff equation. 2½
f) Discuss entropy as criteria of spontaneity and equilibrium. 2½
3. a) Explain 'Order of Reactions'. Derive integrated rate equation for second order reactions when initial concentrations of reactants are equal. 5
b) State the postulates of 'transition state theory'. Derive expression for the rate constant based on equilibrium constant. 5

OR

- | | | |
|----|---|----|
| c) | For a reaction $A \rightarrow B$ the rate constant doubled when temp. Raised from 25°C to 35°C . Calculate the energy of activation of the reaction. | 2½ |
| d) | Explain the effect of (i) Temperature and (ii) concentration on the rates of reactions. | 2½ |
| e) | Explain- (i) Homogenous (ii) Heterogenous catalysis. | 2½ |
| f) | Explain Autocatalysis with suitable example. | 2½ |
| 4. | a) What do you understand by elevation of boiling point?
10g of a substance dissolved in 100g of water raised its boiling point by 0.98°C . Calculate the molecular weight of substance. The molal elevation constant for water is $0.52^{\circ}\text{C}/\text{molal}$. | 5 |
| | b) Explain the application of Magnetic susceptibility in-
i) Detecting the molecular structure of substance
ii) The study of coordination compounds | 5 |

OR

- | | | |
|----------------------------|--|------------------------|
| c) | State Raoult's law how is lowering in vapour pressure related to molecular weight of solute? | 2½ |
| d) | Explain the terms Osmosis and osmotic pressure. | 2½ |
| e) | Explain paramagnetism with suitable example. | 2½ |
| f) | Explain the terms- | 2½ |
| i) | Abnormal molar mass | ii) Vant Hoff's factor |
| 5. Attempt any ten. | | 1x10 |
| i) | Write any two conditions for a solution to be an ideal solution. | |
| ii) | Define upper critical solution temperature. | |
| iii) | Draw phase diagram of water system. | |
| iv) | Write Gibbs Helmholtz's equation. | |
| v) | Define standard free energy. | |
| vi) | Give any two statement of 2 nd law of thermodynamic. | |
| vii) | What is enzyme catalysis? | |
| viii) | What is molecularity of reaction? | |
| ix) | Define first order reaction. | |
| x) | Define molal depression constant. | |
| xi) | Define- | |
| i) | Normality | ii) Mole fraction |
| xii) | Define magnetic susceptibility. | |
