Exam Code: 0431
Sub. Code: 25922

2125

M.Sc. Applied Chemistry(Pharmaceutical)
First Semester
Paper – 103: Physical Chemistry

Time allowed: 3 Hours **Max. Marks: 60**

NOTE: Attempt five questions in all, including Question No. 9 (Unit-V) which is compulsory and selecting one question each from Unit I - IV.

x-x-x

UNIT I

1. a) Elaborate on the concept of partial molar properties. Describe how the partial molar volume of a component can be determined experimentally.

b) Apply the Debye-Hückle treatment to calculate the mean ionic activity coefficient for a dilute electrolyte solution. (6,6)

2. a) Distinguish between the Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac Statistics.

b) Define the partition function and show how the equilibrium constant of a reaction can be calculated from the partition functions. (6,6)

UNIT II

3. a) Give the thermodynamic derivation of the Phase Rule.

b) Describe and classify the different types of two-component systems used in the determination of solid-liquid equilibria, providing one example for each classification. (6,6)

4. a) Explain the graphical representation method for a Three-Component system.

b) Discuss a partially miscible, three-liquid system that contains two partially miscible pairs. Explain the effect of temperature on the phase diagram. (4,8)

UNIT III

5. a) Discuss the primary and secondary salt effects in case of ionic reactions in solutions.

b) What is relaxation technique for measuring fast reactions. Describe the principle

P.T.O.

and working of the temperature-jump method for measuring the rate constants of fast reactions. (6,6)

6. a) What is polymorphism of drugs? Explain its importance in the pharmaceutical industry.

b) Briefly describe the following techniques used for studying fast reactions: Stopped-flow technique and flash photolysis. (6,6)

UNIT IV

7. a) Derive Laplace-Young equation and hence prove that pressure difference in case of spherical drop of radius r is $2\gamma/r$.

b) State and explain the Gibbs adsorption equation. (6,6)

8. a) Derive the B.E.T. equation of sorption. What is its utility in determining the surface area of solids?

b) Explain the salient features of the Slygin-Frumkin (Temkin) equation of sorption. (8,4)

9. Attempt the following

a) What is the importance of excess functions in thermodynamics.

b) In a system consisting of three components A, B, C, locate 40%A, 20%B and 80%C on a triangular diagram.

c) Calculate rotational partition function for F_2 at 25°C, given that moment of inertia, $I = 32.5 \times 10^{-47}$ kg m^2.

d) Prove that pressure difference in case of spherical drop of radius r is $2\gamma/r$. (4x3)

x-x-x