Total: 70 Marks   Time: 3Hours

[Answer Two Question from Each Part]

Part-A

1. (a) What is gas? Write down the general characteristics of gases.   3.0
   (b) What is diffusion? Write down the Graham's law of diffusion.   3.0
   (c) Derive the kinetic gas equation. Deduce the Boyle's law and Charles's law from it.   5.5+2
   (d) Two gases having molecular masses 44 and 64 respectively are enclosed in a vessel.   4.0
       Their masses are 0.5g and 0.3g respectively and the total pressure of the mixture is 740
       mm mercury pressure. Calculate the mole fractions and partial pressures of the two
       gases.

2. (a) Define (any two):   4.0
       i) hydrogen bond, ii) Dipole-dipole interaction, iii) London dispersion force.
   (b) What is surface tension? Write down the effect of temperature on surface tension.   3.0
   (c) What do you mean by viscosity? Determine the viscosity of a liquid by Pioseulle's   5.0
       equation.
   (d) Derivate the Nernst's distribution law.   3.0
   (e) A capillary tube of internal diameter 0.21mm is dipped into a liquid whose density is   2.5
       0.79 gcm^{-1}. The liquid rises in this capillary to a height of 6.30 cm. Calculate the
       surface tension of the liquid. ($g = 980 \text{ cm sec}^{-2}$).

3. (a) What is chemical equilibrium? Write down the characteristics of chemical equilibrium.   4.0
   (b) What is equilibrium constant? Calculate the equilibrium constant for the following   3.5
       equation.
       $$aA + bB \rightleftharpoons cC + dD$$
   (c) Derive the relation between ΔG and K_{eq}.   3.0
   (d) Write down the Le Chatelier's principle. Describe the effect of change of temperature   4.0
       on chemical equilibrium of a reaction.
   (e) What do you mean by exothermic and endothermic reaction? Give example.   3.0

4. (a) Write down and explain the following relation: 4.0+4.0
   (i) Mole fraction and the relative lowering of vapor pressure.
   (ii) Elevation of boiling point and molality.

   (b) Explain the term activity and activity coefficient. Can the activity co-efficient be   3.0
   greater than unity?

   (c) State Vant-Hoff law of osmotic pressure.   3.5

   (d) 0.44 gm of substrates dissolved in 22.2gm of benzene lowered the freezing point of   3.0
   benzene by 0.567 °C. Calculate the molecular weight of the substance. ($K_f = 5.12$ °C
   $mole^{-1}$.)

5. (a) State and explain the Hess' s Law of summation. Write down the application of Hess's   4.0
   Law.

   (b) State and explain the first law of thermodynamics.   3.0

   (c) Define C_p and C_v, and show thermodynamically that for an ideal gas $Cp - Cv = R$.   4.0

   (d) What do you mean by thermodynamic process? Explain different thermodynamic   4.0
   processes.

   (e) Calculate the value of ΔE and ΔH on heating 64.0g of oxygen from 0°C to 100° C. C_p 2.5
   and C_v on average are 5.0 and 7.0 cal $mol^{-1}degree^{-1}$.

6. (a) What is meant by buffer solution and buffer action? Explain why a solution of weak   2.0+4.0
   acid and its salt with a strong base behaves a buffer solution.

   (b) What are acid - base indicators? Discuss the principle involved in the choice of suitable   2.0+4.0
   indicator giving example.

   (c) What is pH scale? How will you calculate pH of a buffer solution?   2.0+3.5