

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – November 2009

CH 3500 - PHYSICAL CHEMISTRY - I

Date & Time: 09/11/2009 / 9:00 - 12:00 Dept. No.

Max. : 100 Marks

PART – A

Answer ALL questions.

(10 x 2 = 20 marks)

01. What is Joule-Thomson effect?
02. What are intensive and extensive properties?
03. State the Hess's law of constant heat summation.
04. Two moles of an ideal gas expands isothermally and reversibly at 300K to twice its original volume, calculate the workdone. ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$).
05. Define the heat of transition.
06. What are freezing mixtures?
07. State Raoult's law.
08. What are azeotropes?
09. Define the term ebullioscopic constant.
10. What are isotonic solutions?

PART – B

Answer any EIGHT questions.

(8 x 5 = 40 marks)

11. Prove that $TV^{\gamma-1} = \text{constant}$ for an adiabatic reversible expansion of an ideal gas.
12. Derive the Kirchoff's equation. Give its applications.
13. One mole of naphthalene was burnt in oxygen gas at constant volume to give carbon dioxide gas and liquid water at 25°C. The heat evolved was found to be 5138.8 kJ. Calculate the enthalpy of reaction at constant pressure.
 $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$.
14. State the postulates of the kinetic theory of gases.
15. Describe the phase diagram of water system.
16. The extent of dissociation of PCl_5 at a certain temperature is 20% at one atm pressure. Calculate the pressure at which this substance is half-dissociated at the same temperature.

17. Explain Le-chatlier –Braun principle, applying it to the formation of ammonia.
18. Explain the phase diagram of a three component system.
19. Write notes on azeotropic distillation.
20. Explain CST of phenol-water system.
21. Derive Nernst distribution law. Give its applications.
22. A 0.5% aqueous solution of potassium chloride was found to freeze at -0.24°C . Calculate the van't Hoff factor and the degree of dissociation of the solute at this concentration ($K_f = 1.86 \text{ K kg mol}^{-1}$).

PART – C

Answer ANY FOUR questions.

(4 x 10 = 40 marks)

23. a) One mole of an ideal gas expands against a constant external pressure of 1 atm from a volume of 10 dm^3 to a volume of 30 dm^3 . Calculate the work done by the gas in joules.
b) Describe Carnot's Cycle and derive expressions for the network done and efficiency.
24. a) Derive any two Maxwell relations.
b) Describe Van't Hoff isochore. Give its applications.
25. a) State and explain III law of Thermodynamics.
b) Draw and Describe the phase diagram of Pb-Ag system.
26. a) Derive the phase rule.
b) Derive Gibbs-Helmoltz equation.
27. a) Discuss on the vapour pressure – composition diagram of solutions.
b) Derive thermodynamically the relationship between molecular weight and molal depression constant.
28. a) Describe Beckmann method of determination of molecular weight of the solute.
b) Explain the following :
 - (i) Non-ideal solution.
 - (ii) Steam distillation.

