LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – NOVEMBER 2011

CH 3504/CH 3500 - THERMODYNAMICS

Date : 12-11-2011   Dept. No.   Max. : 100 Marks
Time : 1:00 - 4:00

PART – A

Answer ALL questions.   **(10 x 2 = 20 marks)**

1. Define state function and path function with an example.

2. Define Joule Thomson effect.

3. What is meant by enthalpy of formation?

4. Explain the standard enthalpy change for the neutralization reaction of a strong acid by a strong base.

5. Distinguish between spontaneous process and non spontaneous process.

6. What is the need for the 2nd law of thermodynamics?

7. What is a reversible process?

8. Explain the effect of concentration in the formation of HI?

9. State the law of mass action.

10. State III law of thermodynamics.

PART – B

Answer any EIGHT questions.   **(8 x 5 = 40 marks)**

11. Explain the postulates of the kinetic theory of gases.

12. Prove that dP is an exact differential using ideal gas equation.

13. Derive the relation between the two heat capacities Cp and Cv of an ideal gas.

14. State Hess's law of constant heat of summation and explain its application.

15. Calculate the reversible work done by 5 moles of an ideal gas during the expansion

    from $1 dm^3$ to $20 dm^3$ on surroundings at 310K.   Also calculate ΔH and ΔS.

16. How is the enthalpy of combustion measured? Explain.

17. Explain the thermodynamic principle of the working of refrigerator.

18. Derive the equation for the entropy of mixing of gases.

19. Derive the Vant Hoff isotherm.

20. Explain the effect of temperature using Le-Chatlier principle for the formation of NH_3.

21. Derive the relationship between K_P and K_C.

22. Explain the Nernst heat theorem.

PART – C

Answer ANY FOUR questions.   **(4 x 10 = 40 marks)**

23. a) Derive vander Waal equation of state.   (5)

    b) Derive Kirchoff's equation.   (5)

24. a) Differentiate bond energy from bond dissociation energy.   (5)

    b) Explain integral heat of solution with an example   (5)

25. a) Derive Gibbs Helmholtz equation and give its application.   (5)

    b) Derive the expression for the efficiency of a Carnot cyclic heat engine working
       between two different temperatures.   (5)

26. a) Derive an expression for the variation of free energy change with temperature.   (6)

    b) Calculate the equilibrium constant for a reaction at 300K whose ΔG^o value at this
       temperature is 29.29 kJ mol^{-1}.   (4)

27. a) Apply law of mass action to N_2O_4 decomposition at equilibrium.   (5)

    b) Explain the factors which alter the state of equilibrium for the above reaction.   (5)

28. a) What are the exceptions to third law of thermodynamics?   (3)

    b) How will you determine the absolute entropy of oxygen gas?   (7)

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