LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

SECOND SEMESTER – **APRIL 2016**

CH 2507/CH 3504/CH 3500 – THERMODYNAMICS

Date: 23-04-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

PART – A

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

1. Define state function and path function with an example.
2. Distinguish between the heat capacities Cp and Cv.
3. Define Joule Thomson coefficient.
4. Explain the standard enthalpy change for the neutralization reaction of a strong acid by a strong base.
5. Define heat of transition.
6. What is need for the second law of thermodynamics?
7. State Trouton's rule.
8. Give the Van't Hoff's isotherm and explain the terms.
9. Explain the effect of concentration in the formation of HI.
10. State third 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. Calculate the reversible work done by 3 moles of an ideal gas during the expansion from 1 dm^3 to 20 dm^3 on surroundings at 310 K. Also calculate ΔU and ΔH.
13. Derive the Kirchoff's equation. Give its application.
14. State Hess's law of constant heat of summation and explain its application.
15. Explain the determination of calorific value using Bomb calorimeter.
16. Derive any two Maxwell's relationships.
17. Explain the criteria for spontaneous process.
18. Calculate the amount of heat supplied to Carnot's cycle working between 368K and 288K if the maximum work obtained is 895 joules.
19. Derive the Van't Hoffs isotherm. Give its applications.
20. The standard concentration equilibrium constant K_c^o for the formation of NH_3 at 673K is 0.5. Find the value of Kp^o if the reaction is $\frac{1}{2} N_2 + 3/2 H_2 \leftrightarrow NH_3$.
21. Explain the process of formation of NH_3 using Lechatlier-Braun Principle.
22. Explain the Nernst heat theorem.

PART – C

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

23. a) Derive Vander Waal's equation of state. (6)
    b) Prove that dP is an exact differential using ideal gas equation. (4)

24. a) State and explain Joule-Thompson effect. (5)
    b) Explain the concept of enthalpy and entropy. (5)

25. a) Explain the bond energy. (5)
    b) Calculate the heat of formation of carbon disulphide given that the heats of combustion of carbon disulphide, carbon and sulphur are -1109 kJ, -394.6 kJ and -298.7 kJ respectively. (5)

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

27. a) State Law of mass action. What is the significance of equilibrium constant? (5)
    b) Calculate the equilibrium constant for a equilibrium reaction at 300K whose ΔG^o value at this temperature is 29.29 kJ mol^{-1}. (5)

28. a) For a water gas reaction at 1000 K the standard Gibb's energy change is -8.1 $kJmol^{-1}$. Calculate the value of equilibrium constant. (3)
    b) How will you determine the absolute entropy of oxygen gas? (7)

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