# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SECOND SEMESTER – **NOVEMBER 2015**

**CH 2507 - THERMODYNAMICS**

Date : 11/09/2015 Dept. No. Max. : 100 Marks
Time : 01:00-04:00

## PART-A

**Answer ALL the questions:** **(10X2=20)**

1. Distinguish between isolated and closed systems.
2. State the first law of thermodynamics and write it's mathematical expression.
3. Enthalpy is a state function- explain.
4. What is heat of transition?
5. Identify the following as exothermic/endothermic process.
   a) Melting of Ice Cube
   b) Nuclear fission
6. Calculate the maximum efficiency of an engine operating between 110°C and 25°C.
7. "The entropy of the universe always tends towards a maximum" – Justify
8. Differentiate ΔG and ΔG°.
9. Give examples for homogeneous and heterogeneous equilibrium.
10. Write the importance of absolute zero.

## PART-B

**Answer EIGHT questions:** **(8X5=40)**

11. Obtain an expression for the work done by a gas in isothermal reversible expansion of an ideal gas.
12. What are the postulates of kinetic theory of gas?
13. Explain any <u>two</u> terms
    a) Adiabatic process
    b) Critical Constants
    c) Joule Thomson Effect
14. Discuss Hess's Law of constant heat summation.
15. Write note on Heat of neutralization.
16. Derive Gibbs-Helmoholtz equation.
17. Derive the thermodynamic equation of state $\left(\frac{\partial U}{\partial V}\right)_T = T\left(\frac{\partial P}{\partial T}\right)_V - P$
18. Explain the thermodynamic principle of the working of refrigerator.
19. Deduce Vant Hoff equation for the temperature dependence of equilibrium constant.
20. Obtain the equilibrium constant for the formation of HI.
21. How are $K_p$ and $K_c$ related. Calculate $K_c$ for the reaction $2SO_{3(g)} \rightleftharpoons 2SO_{2(g)} + O_{2(g)}$.

    for which $K_p = 3.5 \times 10^{-23}$ atm at 27°C.
22. What are the steps involved in the determination of absolute entropy of a gas?

## PART-C

**Answer FOUR questions:** **(4X10=40)**

22. Derive a) Kirchoff's equation b) $C_p - C_v = R$
23. Explain the deviation of real gases from ideal gas behavior and derive the Vander Waal's equation of state.
24. a) Describe the determination of the calorific value using Bomb calorimeter?
    b) Calculate the bond energy of HCl , given that H-H bond energy is 433KJ$mol^{-1}$ , Cl-Cl bond energy is 242KJ$mol^{-1}$ and $\Delta H_f$ for HCl is -91KJ$mol^{-1}$.
25. Describe Carnot's cycle for establishing the maximum convertibility of heat into work.
26. State Le-Chatelier's principle and discuss the conditions that favor
    a) Formation of $NH_3$ b) Decomposition of $N_2O_4$.

28. a)Deduce Vant Hoff reaction isotherm.
    b) Explain Nernst heat theorem.

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