LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2024**

16/17/18UCH3MC01 – THERMODYNAMICS

Date: 08-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

SECTION A

Answer ANY FOUR of the following **4 x 10 = 40 Marks**

1. (a) Write the postulates of kinetic theory of gases. (5)
   (b) What are exact and inexact differentials? (5)
2. (a) State the following: (i) First law of thermodynamics (ii) Principle of equi-partition of energy. (4)
   (b) Obtain the relationship between C_p and C_v. (6)
3. (a) How will you determine the calorific value of a fuel using bomb calorimeter? (6)
   (b) Define enthalpy of combustion and neutralization. (4)
4. Derive Maxwell's thermodynamic relations.
5. (a) What are spontaneous processes? Mention the criterion for spontaneity. (5)
   (b) Obtain the expression for entropy of mixing of an ideal gas. (5)
6. State and explain Le-Chatelier principle. Discuss the dissociation of NH_3 using Le-Chatelier principle.
7. State and explain Nernst heat theorem.
8. Write Sackur Tetrode equation and assumptions of Maxwell–Boltzmann statistics.

SECTION B

Answer ANY THREE of the following **3 x 20 = 60 Marks**

9. (a) Derive van der Waals equation of state. (8)
   (b) Explain the following: (6+6)
   (i) State and path functions (ii) Gas laws
10. (a) State and explain the applications of Hess's law of constant heat of summation. (10)
    (b) Derive Kirchoff's equation. (6)
    (c) One mole of an ideal gas expands isothermally and reversibly from a volume of 20 L to 200 L at 27ºC. Calculate the work done and ΔE. (4)
11. (a) Explain the term bond energy. Discuss the application of bond energy. (10)
    (b) Show that Joule- Thomson expansion is isoenthalpic and adiabatic. (10)
12. (a) Derive Gibbs-Helmholtz equation. Mention its applications. (10)
    (b) Describe how Carnot cycle helpful in stabilising the maximum convertibility of heat into work. (10)
13. (a) Derive the following: van't Hoff equation and van't Hoff isochore. (10)
    (b) State the law of mass action. Derive the relation between K_p and K_c. (10)
14. (a) Explain the determination of absolute entropies of solids, liquids and gases with the help of third law of thermodynamics. (10)
    (b) What is partition function? Obtain the relation between partition function and energy. (10)
