



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

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

**THIRD SEMESTER – NOVEMBER 2013**

**CH 3504/CH 3500 – THERMODYNAMICS**

Date : 16/11/2013  
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

**PART – A**

Answer **ALL** questions:

(10 x 2 = 20 marks)

1. What is an adiabatic process?
2. Define state function and path function with an example.
3. What is meant by calorific value of a fuel.
4. What is meant by enthalpy of combustion?
5. What are exact differentials?
6. What is the need for the second law?
7. Define the term efficiency of an engine.
8. State the law of mass action.
9. Define heat capacity of solids.
10. State third law of thermodynamics.

**PART – B**

Answer any **EIGHT** questions:

(8 x 5 = 40 marks)

11. Derive Vander Walls equation of state.
12. Compare  $W_{rev}$  and  $W_{irrev}$ .
13. Derive Kirchoff equation.
14. State Hess's law of constant heat of summation and explain its application.
15. Explain how is the enthalpy of neutralisation measured.
16. The equilibrium constant  $K_p$  for the reaction  $N_2 + 3H_2 \rightleftharpoons 2NH_3$  is  $1.64 \times 10^{-4}$  at  $400^\circ C$  and  $1.44 \times 10^{-4}$  at  $500^\circ C$ . Calculate the mean heat of formation of 1 mole of ammonia from its elements in this temperature range.
17. Explain the thermodynamic principle of the working of refrigerator.
18. Derive the equation for the entropy of mixing of gases.
19. Derive Van't Hoff reaction isochore.
20. For a water gas reaction at 1000 K the standard Gibb's energy change is  $-8.1 \text{ kJmol}^{-1}$ . Calculate the value of equilibrium constant.
21. Derive the relationship between  $K_p$  and  $K_c$ .
22. Explain Plank's and Randall formulation of third law of thermodynamics.

**PART – C**

Answer ANY **FOUR** questions:

(4 x 10 = 40 marks)

23. a) What is Joule-Thomson coefficient? Give its significance. (5)  
b) Derive the relationship between  $C_p$  and  $C_v$  of an ideal gas. (5)
24. a) Define integral heat of solution and dilution with an example. (5)  
b) Explain the bond energy with a relevant 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) Apply law of mass action to  $N_2O_4$  decomposition at equilibrium. (4)  
b) Explain Joule-Thomson effect and inversion temperature. (6)
27. a) Apply Le-chatlier – Braun principle for the formation of ammonia. (6)  
b) Explain Van't Hoff reaction isotherm. (4)
28. a) Explain Nernst heat theorem. (3)  
b) How will you determine the absolute entropy of oxygen gas? (7)

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