LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **APRIL 2018**

16UCH3MC01– THERMODYNAMICS

Date: 03-05-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART – A

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

1. What is thermodynamics? Give the important objective of it.
2. Define the term path functions.
3. Define the adiabatic process.
4. Give the significance of Joule-Thomson coefficient.
5. Calculate the maximum efficiency of a Carnot engine operating between 27^{o}C and 127^{o}C.
6. What is the need for the second law of thermodynamics?
7. State the law of mass action.
8. State Lechatlier principle.
9. What are the exceptions to third law of thermodynamics?
10. What are microstates?

PART – B

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

11. Derive Van der Waal's equation of state.
12. Explain the principle of equipartition of energy.
13. Obtain a relationship between C_p and C_v.
14. Derive an expression for the work done in a reversible, isothermal process.
15. Derive the Kirchoff's equation. Give its application.
16. Explain the method for the determination of enthalpy of combustion.
17. Derive Gibbs-Helmholtz equation.

18. The equilibrium constant K_p for the reaction $N_2 + 3H_2 = 2NH_3$ is 1.64×10^{-4} at 400°C and 1.44×10^{-4} at 500°C. Calculate the mean heat of formation of 1 mole of ammonia from its elements in this temperature range.

19. Derive Van'tHoffsisochore.

20. Explain the Nernst heat theorem.

21. Differentiate classical thermodynamics from statistical thermodynamics.

22. A system of N particles has among others, two energy levels with $g_1 = 2$, $g_2 = 3$, $U_1 = 44$ kJ/mol and $U_2 = 58$ kJ/mol. Calculate the ratio of number of particles in the two energy states at 500 K.

PART – C

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

23. a) Explain the postulates of the kinetic theory of gases. **(5)**

b) What is Joule-Thomson coefficient? Give its significance. **(5)**

24 a) Derive an expression for work done in isothermal reversible expansion of an ideal gas. **(5)**

b) Discuss the method of determination of calorific values of fuels using Bomb's calorimeter. **(5)**

25. a) Derive SackurTetrode equation. **(5)**

b) 4g of ammonium nitrate were dissolved in 200g of water taken in a calorimeter (water equivalent 40g). A fall in temperature of 1.32 K was noted. Calculate the enthalpy of solution of ammonium nitrate at this concentration. **(5)**

26. a) Discuss the thermodynamics of Carnot cycle. **(5)**

b) Derive Maxwell's equation. Give its applications. **(5)**

27. a) Apply law of mass action for the formation of HI. **(5)**

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

28. a) How will you determine the absolute entropy of oxygen gas? **(5)**

b) Derive Maxwell-Boltzmann statistics. **(5)**

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