LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – NOVEMBER 2017

CH 3504 – THERMODYNAMICS

Date: 04-11-2017   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

Part A

Answer all questions   **(10 x 2 =20 marks)**

1. State the First law of thermodynamics.
2. What is Inversion temperature?
3. Define heat of neutralization. Write its unit.
4. Write the relation between enthalpy and internal energy.
5. What is the need for Second law of thermodynamics?
6. Complete   A = _____
7. Define Le Chatlier Braun Principle
8. Complete Kp =_____ Kc
9. Give the expression for the equilibrium constant for the dissociation of ammonia
10. What happens to G and S in a r eversible process?

Part B

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

11. Distinguish between (a) Isothermal and Adiabatic Process

    (b) Enthalpy and Entropy.

12. Explain the postulates of Kinetic theory of gases

13. Derive the van der Waals equation of state.

14. Calculate the reversible work done by 8 moles of an ideal gas during the expansion from $5dm^3$ to $15 dm^3$ on the surroundings at 50^oC. Calculate ΔH also.

15. (a) The heat involved in dissolving $CuSO_4$ (s) in water is 86.6 KJ/mol. If ΔH_f^o (Cu^{2+}) is 64.4kJ/ mol .What is $H_f^o(SO_4^{2-})$? Given $H_f^o(CuSO_4)$ =-770KJ/mol.(b) Define Hess's law.   **(3+2)**

16. Derive how ΔG varies with temperature and pressure.

17. (a) Calculate ΔG when 1mle of an ideal gas expands reversibly and isothermally at 37^oc from an initial volume of $55dm^3$ to $1000dm^3$. (b) Write the physical significance of entropy.   **(2+3)**

18. (a)100% efficiency in a heat engine cannot be achieved. Explain.(b) Calculate the maximum efficiency of an engine operating between 110^oc and 25^oc.

19. Apply Lechatlier's principle for the synthesis of ammonia by Haber's process and explain.

20. Derive Van't Hoff equation

21. Explain Nernst Heat Theorem. How does it lead to the enunciation of III law of thermodynamics?

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Part C

22. What state and path functions? Explain each with an example.

23. (a) Prove that $C_p - C_v = R$ for an ideal gas. (b) Derive Kirchoff equation (5+5)

24. Explain a method to measure the enthalpy of Combustion.

25. Derive entropy change of an ideal gas when (a) T and V are two variables

(b) T and P are two variables.

26. (a) The value of Kp for the reaction

$CO_{(g)} + H_2O_{(g)} \leftrightarrow CO_{2(g)} + H_{2(g)}$ is 1.06 x 10^5 at 25°c. Calculate ΔG for the reaction. **(4)**

(b) With the help of Le Chatlier Braun principle explain the effect of temperature and pressure on the dissociation of Nitrogen tetroxide. **(6)**

27. Derive the Van't Hoff Reaction isotherm

28. Determine the absolute entropy of a gas at 25°c under atmospheric pressure

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