CLASS – XI CHEMISTRY THERMODYNAMICS

ASSIGNMENT NO. 9

Q1. Define the following: - (a) System (b) Surroundings (c) Boundary

Q2. Explain the following types of system with e.g. (a) Open system (b) Closed system (c) Isolated system

Q3. Why internal energy is a state function but work is not?

Q4. What is an adiabatic process? Give example.

Q5. What is first Law of thermodynamics? Give its mathematical representations.

Q6. Under what condition ΔH becomes equal to ΔU?

Q7. Derive the relation of work done for a reversible process at constant temperature.

Q8. List the important sign conventions for heat & work.

Q9. Starting with the thermodynamics relationship H = U + PV, derive the following relationship

$\Delta H = \Delta U + \Delta HgRT$

Q10. What are extensive & intensive properties? Give two egs of each.

Q11. Derive the relation $C_p - C_v = R$

Q12. Define the following: - (a) Standard enthalpy of reactions (b) Standard enthalpy of fusion, Vaporization, sublimation (c) Standard enthalpy of formation.

Q13. State Hess's law of constant Hear summation: - Calculate the enthalpy of formation of CO from the following data:-

(i) $C + O_2 \rightarrow CO_2 \quad \Delta H = -393.5$ kJ/mole

(ii) $CO + \frac{1}{2} O_2 \rightarrow CO_2 \quad \Delta H = -283.0$ kJ/mole

Q14. Illustrate the following with suitable examples:-

(a) Enthalpy atomization (ii) Enthalpy of combustion (iii) Bond Energy (iv) Enthalpy of solution (v) Lattice enthalpy

Q15. Define the term entropy. How does $T\Delta S$ determine the spontaneity of a process?

Q16. How is Gibbs free energy related to enthalpy, entropy & temperature of a system? How is this used in determining the spontaneity of a process?

Q17. Cal w, q & ΔU when 0.75 mole of an ideal gas expands isothermally & reversibly at 27^0C from volume of 15L to 25 L.

Q18. Calculate the standard internal energy change for the reaction at 25^0C:-

$C_2H_4(g) + 3O_2(g) \longrightarrow 2CO_2(g) + 2H_2O(l)$

ΔH for C_2H_4 (g) = 52.30 kJ/mole, CO_2 = - 393.5 kJ/mole

H_2O = - 286 kJ/mole R = 8.314 J/K/mole.

Q19. Calculate the enthalpy of combustion of ethylene to form CO_2&H_2O(g) at 298K & 1 atm pressure. The enthalpies of formation of CO_2, H_2O & C_2H_4 are – 3937, -241.8, + 52.3 kJ/mole respectively.

Q20. Calculate the bond enthalpy of HCl. Given that the bond enthalpies of H2 & Cl2 are 430 kJ/mole & 242 kJ/mole respectively & ΔHf for HCl is -91 kJ/mole.

Q21. Find the entropy change involved in conversion of 1 mole of solid ice at 273K to liquid water at the same temperature (latent heat if fusion = 6025J/mole).

Q22. Calculate the equilibrium constant K for the reaction at 400K.

$2NOCl(g) \rightleftharpoons 2\,No.(g) + Cl_2(g)$

Given that $\Delta_r H^0 = 80$ K J /mole $\quad \Delta_r S^0 = 120$ K J/mole at 400 K

Q23. The standard free energy change for a reaction is -212.3 kJ/mole. If the standard enthalpy change is -216.7 kJ/mole. Calculate the standard entropy change at 298K.

Q24. ΔH & ΔS of a chemical reaction are 40.63 kJ/mole & 108.8 J/K/mole respectively. Find free energy change at 27^0C & also predict the feasibility of the reaction.