Chemical Thermodynamics

1. Derive the expression of work done in isothermal reversible & irreversible process for n mole of ideal gas.
2. What do you mean by the term internal energy & enthalpy? How are they inter related?
3. Define extensive & intensive property with example.
4. Discuss an isothermal-adiabatic process.
5. Prove that for one mole ideal gas $C_P - C_V = R$.
6. Prove that for ideal gas in adiabatic reversible process PV^{γ} = Constant.
7. How will you show that adiabatic P-V curve will be steeper than isothermal P-V curve?
8. Show that when $\gamma \to 1$, the work done in the adiabatic reversible expansion is equal to that of the isothermal reversible expansion.

11. Define heat of reaction, heat of formation, heat of combustion and heat of neutralization.
12. Derive the relation between heats of reaction at constant pressure with that of at constant volume. Derive Kirchoff's equation.
13. Calculate the work done by 2 moles of an ideal gas during expansion from 2 atm at 0^oC to 1 atm 27^0C against a constant pressure of 1atm.
14. One mole of H_2 gas at 100^oC is compressed adiabatically & reversibly from 1atm to 10atm.Assuming ideal behaviour calculate ΔU & ΔH.Given C_P=6.9cal.deg^{-1}mole.
15 i) Derive the relation between heat of reaction at constant pressure and heat of reaction at constant volume.

   ii) Derive Kirchoff's equation.
16. i) State second law of thermodynamic.
17. derive gibbs-Helmholtz equation
18. What is Joule-Thomson effect? How do you account for it? Show that the J-T expansion is iso-enthalpic process. Define J-T coefficient (μ) & inversion temperature of gas.
19. Show that $\mu = \frac{2a}{Rb}$ where a & b are Vander Waal's constant.

19. prove i) $(dS/dV)_T$ = $(dP/dT)_V$ ii) i) $(dT/dP)_S$ = $(dV/dS)_P$ iii) i) $(dS/dP)_T$ = $(dV/dT)_P$ ix) $(dT/dV)_S$ = $(dP/dS)_V$

20. Prove that i) $d/dT(G/T)_P = -(H/T^2)$, ii) $dH_P = dq_P$ for mechanical work

22. Prove that dq is not a perfect differential but dq/T is a perfect differential.\

23. What is the physical significance of entropy.Calculate the entropy change when 10gms of Neon is heated from 27^0C to 227^0C at constant volume. C_v=3cal/mole.

24. 100 gms of nitrogen initially at 25^0C and 10 atm expands adiabatically against a constant pressure of one atmosphere. Assume the gas to be ideal and its heat capacity C_p= 6.96 cal/mole. Calculate the final temperature. ΔU, ΔH.

25. One mole of H_2 gas at 100^oC is compressed adiabatically & reversibly from 1atm to 10atm.Assuming ideal behaviour calculate ΔU & ΔH.Given C_P=6.9cal.deg^{-1}mole.