Maxwell's Thermodynamical Relations and Their Applications.

Q1. Define four Thermodynamic potentials. what are basic variables on which they depend ?. using these potentials derive Maxwell's Relations.

Q2. using Maxwell's Thermodynamic Relations, Prove for one mole of an Ideal gas $C_p - C_v = R$.

Q3. write direct expression for change in temperature in Joule-Thomson effect. & and Prove Ideal gas Show neither heating nor cooling effect in Joule-Thomson effect.

Q4 write down the Maxwell Thermodynamic Relations and discuss Cooling Produced by Adiabatic expansion.

Q5. At one atmospheric Pressure, napthalene melts at 80°C, its latent Heat of fusion is 4500 calories per mole and Increase in Volume on fusion = 18 cm^3 per mole, calculate the melting point if the Pressure is Raised to 10 Atmosphere.

"ENTROPY AND CARNOT'S CYCLE"

Q1. What is disorder? Why does a natural system always tend to change in the direction of increasing disorder.

Q2. Define Peltier and Thomson coefficients. Derive the Relation

$$\pi = T\frac{dE}{dT} \quad \text{and} \quad \sigma_a - \sigma_b = T\frac{d^2E}{dT^2}$$

where symbols have their usual meanings.

Q3. What is Carnot's cycle? On what factors does the efficiency of Reversible Carnot's engine depend? What did this lead, Lord Kelvin to?

Q4 Calculate the change in entropy when 1kg of ice at 0°c melts to water at 0°c, Latent Heat of melting of ice is 80 Cal/gm.

Q5. Write the first law of Thermodynamics in the differential form, Explain the significance of different terms and Comment on the significance of this Law.

Rounding ①

Section - C
(PART-I) (STATISTICAL ENTROPY).
(Heat & Thermodynamics)

Q1. Give the statistical defination of entropy and show that when an infinitesimaly small amount of Heat 'dQ' is added to system, keeping its volume and number of Pasticles constant, the change in entropy is

$$\boxed{dS = \frac{dQ}{T}}$$

Q2. Draw T-S diagram for Isobaric, Isochoric, Isothermal, and Adiabatic Processes.

Q3. '100'gm of water at 0°c is mixed with an equal amount of water at 80°c. Calculate the increase in entropy. specific Heat of water is 1 cal/gm.

Q4. Show that the Process of diffusion of one gas into another is always accompanied by increase in entropy.

Q5. (A) How entropy changes during free expansion of the gas?

(B) Calculate the number of accessible micro-states (W) of a System having an entropy of '20 cal/K in equilibrium state. what is its equivalent value on logarithmic

Rounding ① · Section - C

(PART-II) (CARNOT-THEORY)

(Heat & Thermodynamics)

Q1. for a Thermo-couple, Show Thermodynamically that $\sigma_a - \sigma_b = T\frac{d^2E}{dT^2}$, where the symbols have their usual meanings.

Q2. A gas satisfies the equation $P(V-b) = RT$, so find the change in entropy of a gas as it expands isothermally from volume 'V_1' to 'V_2'.

Q3. How can you increase the efficiency of Heat engine from '40%' to 50%' Keeping the temperature of its Surroundings at 27°C.

Q4. (A) what do you mean by Coefficient of Performance of Refrigerator? what is its significance?

(B) How does the internal energy of a System vary during adiabatic expansion?