

Practice session III

Thermodynamics

1. Calculate Joule's coefficient for a gas obeying the following equation of states:
I. $P(V-b) = RT$
II. $(P + \frac{a}{V^2}) V = RT$
2. Consider a reversible process described by the general relation $pV^n = C$, where C is a constant. The gas (consider it ideal) is expanded from pressure P_1 to P_2 . Prove that, the work in this process is $\frac{RT}{n-1} [(\frac{P_2}{P_1})^{n-1} - 1]$
3. Heat of neutralization of HCl with NaOH is $-13.7 \text{ Kcal.mol}^{-1}$. When 10 mL 0.1(N) acetic acid is neutralized by 10 mL 0.1 (N) sodium hydroxide, enthalpy change is -12.5 Cal . Calculate the heat of dissociation of acetic acid.
4. n mole of ideal gas undergoes isothermal reversible expansion from volume V_1 to V_2 at temperature T . Calculate the (a) $\Delta_{\text{sys}}S$, (b) $\Delta_{\text{surr}}S$, (c) $\Delta_{\text{total}}S$. Comment on the result.
5. A Carnot engine works between 600K and 300K using one mole of O_2 ($C_v = 5 \text{ cal.K}^{-1}.\text{mol}^{-1}$) as the thermodynamic substance. The gas is initially taken at a pressure of 20 atm while the atmosphere pressure is 1 atm. Calculate the work obtained per cycle.