Assignment-1

Q1. Find the Mayer's relation (Difference between C_p and C_v) for real gases obeying the equation of state $\left(P + \frac{a}{v^2}\right)(v - b) = RT$.

Q2. Show that the coefficient of volume expansion and isothermal compressibility of a real gas (as previous question) are respectively.

1. $\frac{Rv^2(v-b)}{RTv^3-2a(v-b)^2}$
2. $\frac{v^2(v-b)^2}{RTv^3-2a(v-b)^2}$

Q3. An ideal gas undergoes a process in which its internal energy 'U' is related to its volume 'V' as $U = aV^b$, (a,b constants). Show that the work done by the gas and quantity of heat transferred to the system to increase its internal energy by ΔU are respectively

1. $\frac{\Delta U}{b}(r-1)$ $\qquad r = \frac{c_p}{c_v}$
2. $\frac{\Delta U}{b}(1 + (r-1)b)$ $\qquad r = \frac{c_p}{c_v}$

Q4. The equation of state for NO is $p(v - nb) = nRT$. where b = 40 c.c./mole. Calculate the maximum work done when 7.5 gm of gas expands isothermally at 47°C from 5 to 25 litres.

Q5. The internal energy of a thermodynamic system is $U = AP^2V$. A is a constant of the dimension $[P]^{-1}$. Find the equation for adiabatic process.