(b) Enthalpy is given by $H = U + PV$. Also H is given to be a function only of the variables S, P, N. Show that

$$\frac{\partial H}{\partial P} = V, \quad \frac{\partial H}{\partial N} = \mu,$$

where the symbols have their usual thermodynamic meanings. [4+3]

7. An ideal Van der Waal fluid is described by the following equations of state:

$$\frac{1}{T} = \frac{cR}{u + a/v}, \quad \frac{P}{T} = \frac{R}{v - b} - \frac{acR}{uv^2 + av},$$

where a, b, c are constants. Find the fundamental relation $s(u, v)$ for the fluid. Show the limiting behavior of a classical ideal gas. [6]

8. (a) From the fundamental relation $S(U, V, N)$, derive the expression for $d\hat{s}$ in terms of $d\hat{u}$ and $d\hat{n}$, where $\hat{s} = S/V, \hat{u} = U/V, \hat{n} = N/V$.

(b) Calculate the work done in isobaric expansion of two moles of monoatomic ideal gas from temperature 200K to 350K. [4+3]