Exercise 4.6

Thursday, 30 April 2020 19:47

$C_v = \frac{5}{2} R$

$n = 2\ kmol$

$T_i = 27^\circ C$

$T_f = 227^\circ C$

ideal gas: $PV = RT$

$PV = nRT$

$C_v = \left(\frac{\partial u}{\partial T}\right)_v \Longrightarrow du = C_v dT$

integrating

$\Delta U = \int_{T_i}^{T_f} C_v \, dT$

$= C_v (T_f - T_i)$

$\Downarrow$

$\Delta U = n C_v (T_f - T_i) = 2 \cdot 10^3 \cdot 8.3145 \cdot \frac{5}{2} \cdot 200 = 8.31 \times 10^6 J$

$= 227 - 27$

b) $h = u + Pv$

$\Delta h = \Delta u + \Delta(Pv)$

$\Delta H = \Delta U + \Delta(PV)$

$= \Delta U + nR\Delta T$

$= 8.31 \times 10^6 J + 2 \cdot 10^3 \cdot 8.3145 \cdot 200 = 1.16 \times 10^7 J$