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Thermo Quiz 7

1.) $du = Tds - Pdv$ $\quad dH = Tds + VdP$

$\frac{du}{T} = ds = \frac{C_v dT}{T} \Rightarrow \Delta S = C_v \ln\left(\frac{T_2}{T_1}\right)$

$\Delta U = Q + W_{EC} + W_S \therefore \Delta U = 0 = \Delta U_1 + \Delta U_2$

$\therefore m_1 C_1 (T_2 - T_1)_1 + m_2 C_2 (T_2 - T_1)_2 = 0$

$m_1 C_1 T_2 - m_1 C_1 T_{11} + m_2 C_2 T_2 - m_2 C_2 T_{12}$

$m_1 C_1 T_2 + m_2 C_2 T_2 = m_1 C_1 T_{11} + m_2 C_2 T_{12}$

$T_2 = \frac{m_1 C_1 T_{11} + m_2 C_2 T_{12}}{m_1 C_1 + m_2 C_2}$

2.) $\Delta S = C_v \ln\left(\frac{T_2}{T_1}\right) = C_1 \ln\left(\frac{T_2}{T_1}\right)_1 (m_1) + C_2 m_2 \ln\left(\frac{T_2}{T_1}\right)$

3.) $\Delta S = S_{gen} + \int_1^2 \frac{Q}{T} \therefore \Delta S = S_{gen}$

4.) $V_1 = 0.08 m^3$ $\quad P_1 = 100 kPa$ $\quad T_1 = 300K = T_2$

$V_2 = 0.001 m^3$ $\quad P_2 = 0.001 m^3$

$du = Tds - PdV$ $\quad dH = Tds + VdP$

$\Delta u = Q + W_{EC} + W_S$ $\quad W_{EC} = -\int_1^2 PdV$

$du = Tds$ $\quad du = C_v dT$

$C_v \Delta T + P\Delta V = Q$

Reversible: $S_{gen} = 0$

5.) $T_H = 1200K$ $\quad Q_H = 500\frac{kJ}{s} = kW$

$T_C = 300K$

$$\eta_\theta = 1 - \frac{T_C}{T_H} = 0.75$$