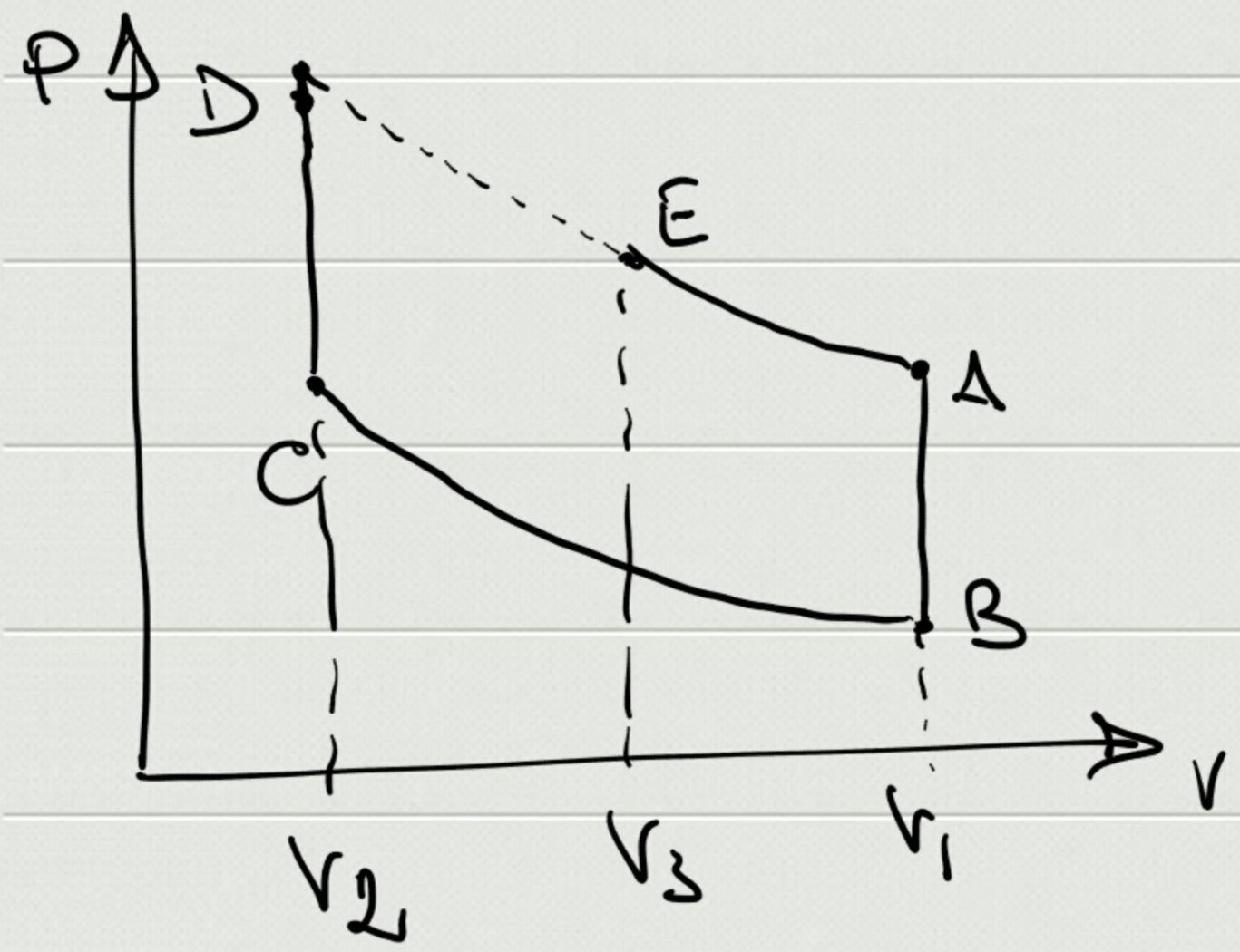
$n = 1$, $c_V = 20$ J/kmol



$T_A = 500$ K

$T_B = 300$ K

EA, BC: isot. rev.

AB, CD: Isocore rev.

DE: espans. libera

$V_1 = 0,5 \text{ m}^3$ $V_2 = 0,3 \text{ m}^3$ $V_3 = 0,35 \text{ m}^3$

η, $\Delta S_{gen,DE}$, $\Delta S_{univ,ciclo}$

$W_{AB} = 0$ $Q_{AB} = nc_V (T_B - T_A) < 0$

$W_{BC} = Q_{BC} = nRT_B \ln \frac{V_2}{V_1} < 0$

$W_{CD} = 0$ $Q_{CD} = nc_V (T_D - T_C) > 0$ $(T_D = T_A)$

$W_{DE} = Q_{DE} = 0$

$W_{EA} = Q_{EA} = nRT_A \ln \frac{V_1}{V_3} > 0$

$$\eta = \frac{W}{Q_{ASS}} = \frac{W_{BC} + W_{EA}}{Q_{CD} + Q_{EA}} = 0.038$$

$$\Delta S_{gas,DE} = nR \ln \frac{V_3}{V_2} = 1.28 \ J/K$$

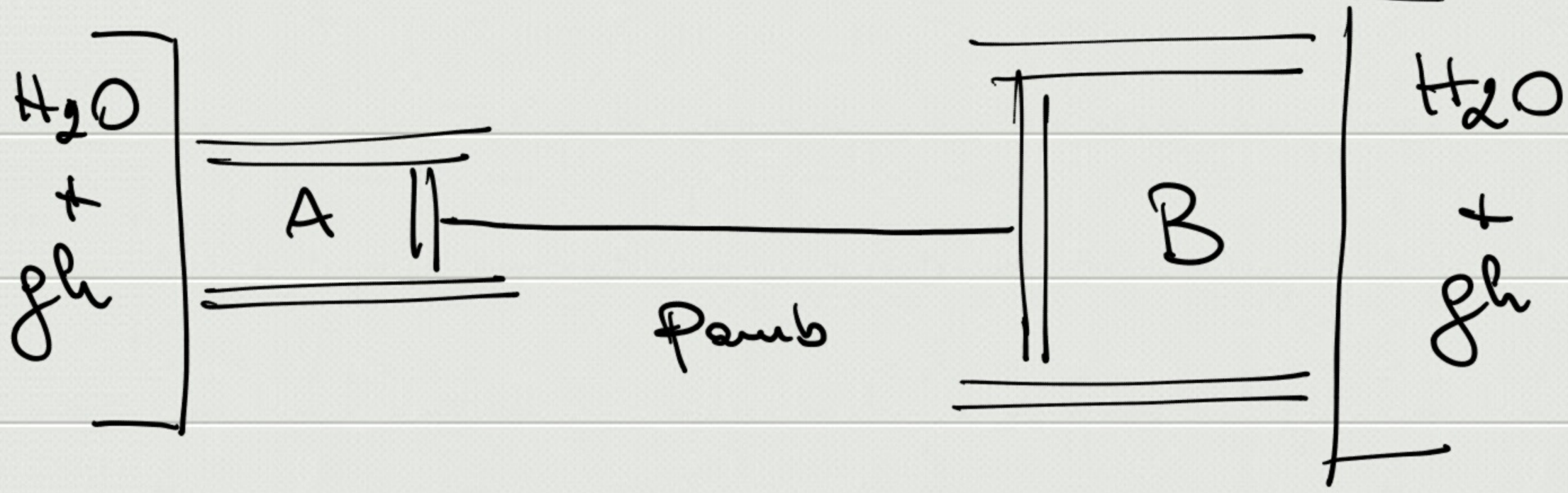
$$\Delta S_{u,ciclo} = -\frac{Q_{AB}}{T_B} - nR \ln \frac{V_C}{V_B} - \frac{Q_{CD}}{T_D} - nR \ln \frac{V_A}{V_E}$$

$$= nR \ln \frac{V_E}{V_D} \quad *$$

$$= nR \ln \frac{V_E}{V_D} - \frac{nRT_D \ln \frac{V_E}{V_D}}{T_D}$$

$$= -\frac{Q_{AB}}{T_B} - nR \ln \frac{V_C}{V_B} - \frac{Q_{CD}}{T_D} - nR \ln \frac{V_E}{V_D} - nR \ln \frac{V_A}{V_E}$$

$$\Delta S_{UNIV} = \Delta S_{UNIV,DE} = \Delta S_{gas,DE}$$



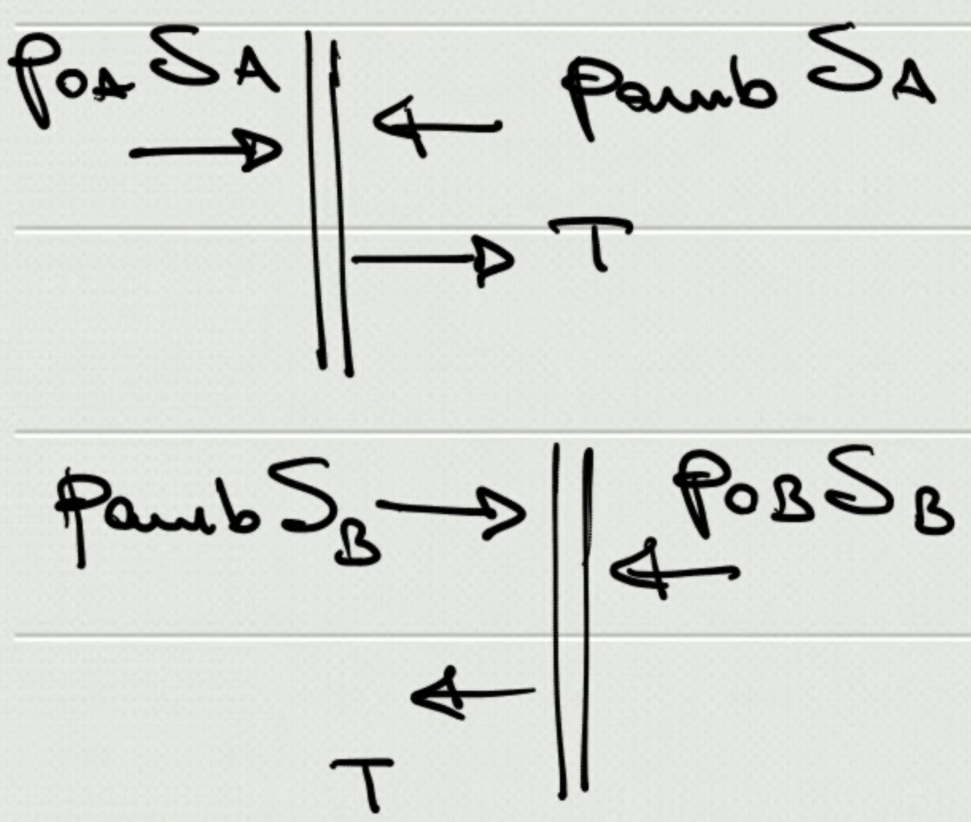
$T_0 = 273.15\ K = T_{0A} = T_{0B}$ $\quad p_{amb} = 10^5\ Pa$

$n_A = 0,1$ $\quad n_B = 0,4$ moli

$S_A = 0.05\ m^2$ $\quad S_B = 0,1\ m^2$ $\quad V_{0A} = 0.01\ m^3$

$p_{0A}, p_{0B} = ?$ $\quad n_A, n_B = ?$, $\Delta S_U = ?$

$$p_{0A} = \frac{nRT_0}{V_{0A}} = 0.227 \cdot 10^5\ Pa$$



$$\Rightarrow \begin{cases} p_{0A} S_A + T - p_{amb} S_A = 0 \\ p_{amb} S_B - T - p_{0B} S_B = 0 \end{cases}$$

$$p_{amb}(S_B - S_A) + p_{0A} S_A - p_{0B} S_B = 0$$

$$\Rightarrow p_{0B} = 0.618 \cdot 10^5 \text{ Pa}$$

$$m_A \, l_g = -Q_A = -nRT_0 \ln \frac{V_A}{V_{0A}} \qquad \text{NO}$$

$$= -Q_A = -W_A = -p_{amb}(V_A - V_{0A}) \; *$$

$$= p_{amb}(V_A - V_{0A}) \qquad \left(V_A = \frac{nRT_0}{p_{amb}}\right)$$

$$= nRT_0 \ln \frac{V_A}{V_{0A}} \qquad \text{NO}$$

$$W_{gas} = -W_{amb} = -p_{amb} \Delta V_{amb} = p_{amb} \Delta V_{gas}$$

$$= Q_{gas} = -Q_{gh} = -m_A l_{gh}$$

$$\Rightarrow m_A = 2.4 \cdot 10^{-3} \text{ kg}$$

$$m_B = 1.73 \cdot 10^{-3} \text{ kg}$$

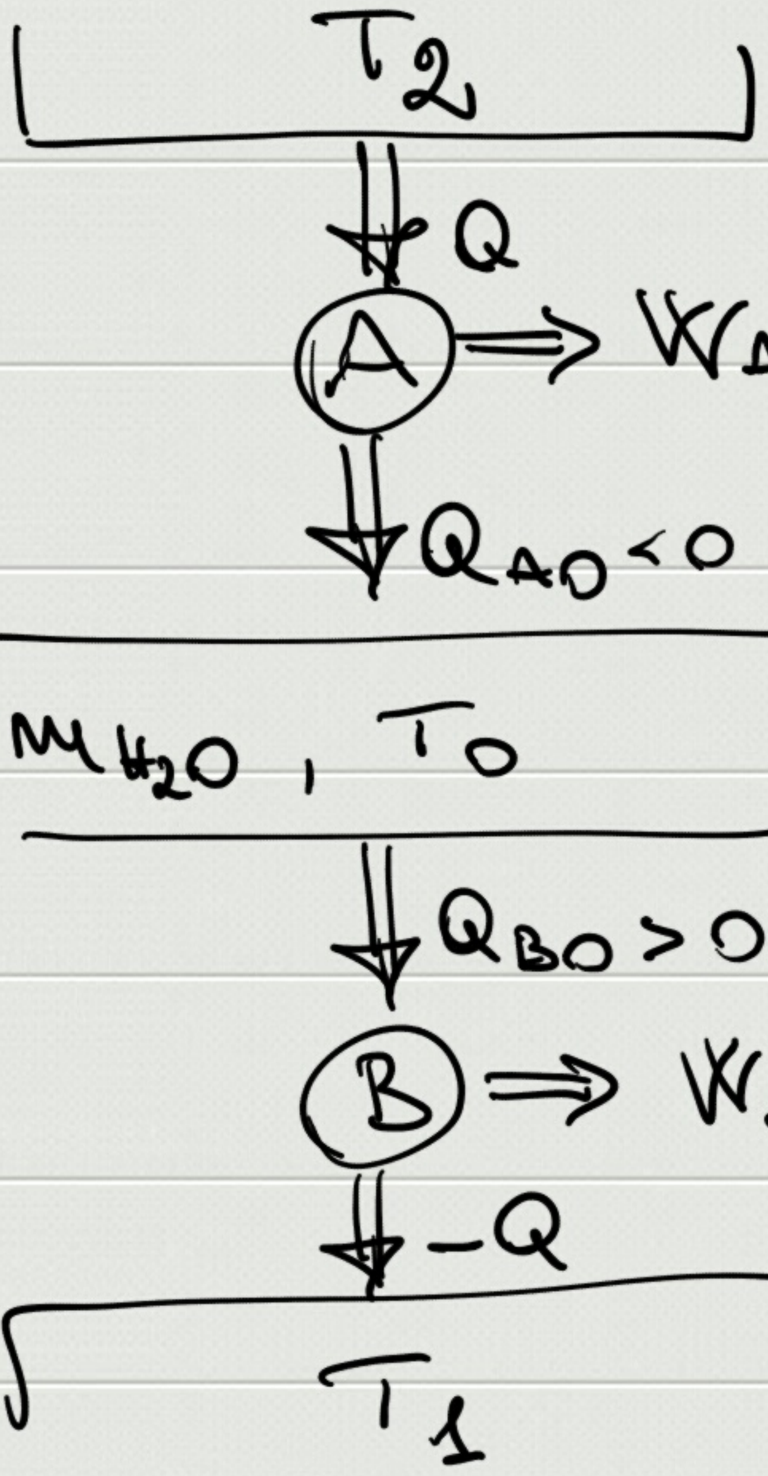
$$\Delta S_{U,A} = \frac{m_A c_g}{T_0}$$

$$= \frac{m_A c_g}{T_0} + nR \ln \frac{V_A}{V_{0A}} \quad *$$

$$= -\frac{m_A c_g}{T_0}$$

$$= -\frac{m_A c_g}{T_0} + nR \ln \frac{V_A}{V_{0A}}$$

$$\Delta S_U = \Delta S_{U,A} + \Delta S_{U,B} = 2,16 \ J/K$$



$T_2 = 400\ K$

$M_{H_2O} = 1\ kg$

$T_0 = 273.15\ K$

$T_1 = 100\ K$

$Q = ?$ $(H_2O \rightarrow gl)$

$W_{TOT} = ?$

$$\begin{cases} \dfrac{Q}{T_2} + \dfrac{Q_{AO}}{T_0} = 0 \\ \dfrac{Q_{BO}}{T_0} + \dfrac{-Q}{T_1} = 0 \end{cases}$$

$$\Rightarrow \frac{1}{T_0}\left(Q_{AO} + Q_{BO}\right) + \frac{Q}{T_2} - \frac{Q}{T_1} = 0$$

$$m_{gl} = \underset{>0}{Q_{BO}} + \underset{<0}{Q_{AO}} \geq 0$$

$$\Rightarrow m_{gl} = T_0\left(\frac{Q}{T_1} - \frac{Q}{T_2}\right) = Q T_0 \left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

$$Q = \frac{m\lambda_g}{T_0} \frac{1}{\frac{1}{T_1} - \frac{1}{T_2}} \approx 1.6 \cdot 10^5 \, J$$

$$W_{TOT} = Q$$

$$\overset{!}{=} (Q - Q_{A0}) + (Q_{B0} + Q)$$

$$\overset{!}{=} Q - Q_{A0} - Q_{B0}$$

$$\overset{!}{=} (Q + Q_{A0}) + (Q_{B0} - Q)$$

$$W_A = Q + Q_{A0}$$

$$W_B = Q_{B0} + (-Q)$$

$$W_A + W_B = W_{TOT} = Q_{A0} + Q_{B0} = 3.3 \cdot 10^5 \, J$$