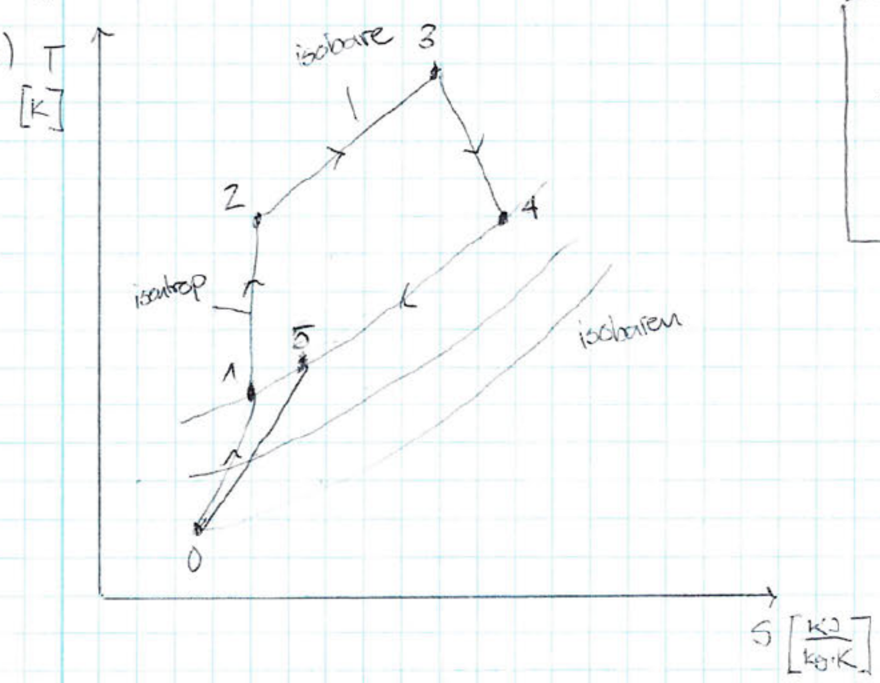
[redacted]

Aufgabe 2

a)



Interpolationsformel:

$$Y = Y_1 + \frac{Y_2 - Y_1}{X_2 - X_1}(X - X_1)$$

b) $p_0 = p_6$

$\cancel{\frac{dE}{dt} = \sum \dot{m}_i \cdot h_i}$

stat. FP um Schubdüse: $0 = \dot{m}(h_5 - h_6) + \overset{0}{\dot{Q}} - \dot{W}$

$\dot{W} = \dot{m}(h_5 - h_6)$, $h_5(0{,}5\,\text{bar}, 431{,}9\,K) =$

interpolieren für $x_1 = 430K$, $x_2 = 440K$, in TAB-A22

$\dot{m}_{ges} = \dot{m}_M + \dot{m}_K$, $\dot{m}_M = 5{,}293\,\dot{m}_K$

$\dot{m}_{ges} = 6{,}293\,\dot{m}_K$

c) $\dot{E}_{x,Str} = \dot{m}_{Ges}\left(h_6 - h_0 - T_0(s_6 - s_0) + \frac{1}{2}\left(w_6^2 - w_0^2\right)\right)$

d) $\cancel{\dot{E}_{x,verl} = \dot{m}_{Ges}(h_6 - h_0 - T_0(s_6 - s_0)}$

$\dot{E}_{x,verl} = \dot{m}_{Ges}\left(h_0 - h_6 - T_0(s_0 - s_6) + \frac{1}{2}(-w_6^2 + w_1^2)\right) + \sum_j \left(1 - \frac{T_0}{T_j}\right)\dot{Q}_j - \sum_t \dot{W}_t$

$\Delta e_{x,Str} = 100 \frac{kJ}{kg}$, $\dot{e}_{x,Q} = \left(1 - \frac{T_0}{T_B}\right) \cdot \dot{q}_B = \left(1 - \frac{293K}{1289K}\right) \cdot 1195 \frac{kJ}{kg \cdot s} = 969{,}72 \frac{kJ}{kg \cdot s}$

$\cancel{e_{x,verl} = \frac{1}{\dot{m}_{Ges}}}$

$0 = s_0 - s_6 + \frac{\dot{q}_B}{T_B} + \dot{S}_{erz} \cdot \frac{1}{\dot{m}_{Ges}}$, $\dot{E}_{x,verl} = T_0 \cdot \dot{S}_{erz}$, $\dot{e}_{x,verl} = T_0 \cdot \dot{s}_{erz}$

$\dot{s}_{erz} = s_6 - s_0 - \frac{\dot{q}_B}{T_B}$, $s_6 - s_0 = \int_{T_0}^{T_6} \frac{c_p^{ig}}{T} dT - R \cdot \ln\left(\frac{p_6}{p_0}\right)$, $R = \frac{\overline{R}}{M_{air}}$, $M_{air} = 28{,}97 \frac{g}{mol}$

$e_{x,verl} = \cancel{T_0 \cdot \left(c_{p_L}^{ig}(T_6 - T_0)\right.}\; T_0 \cdot \left(c_{p_L}^{ig} \cdot \ln\left(\frac{T_6}{T_0}\right) - \cancel{\frac{\overline{R}}{M_{air}} \cdot \ln\left(\frac{p_6}{p_0}\right)} - \frac{\dot{q}_B}{T_B}\right)$

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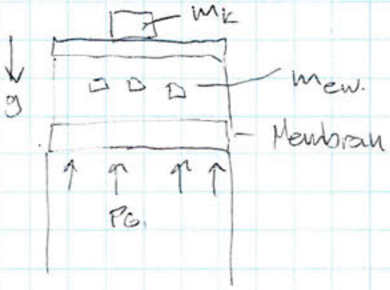
3. a)



$$m_K g + p_0 A + m_{EW} g = p_{G_1} A$$

$$\frac{g}{A}(m_K + m_{EW}) + p_0 = p_{1G}$$

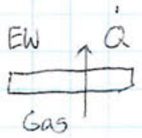
$$\frac{9.81 \frac{m}{s^2}}{(0.05m)^2 \pi}(32kg + 0.1kg) + 1 bar = \underline{1.4 bar = p_{G_1}}$$

0.05m

$$p_{G_1} V_{g_1} = m_{G_1} \cdot \frac{\bar{R}}{M_g} \cdot T_{g_1} \quad , \quad M_g = 50 \frac{kg}{kmol}$$

$$m_{G_1} = \frac{p_{G_1} \cdot V_{g_1}}{T_{G_1} \cdot \frac{\bar{R}}{M_g}} = \frac{1.4 bar \cdot 3.14 \cdot 10^{-3} m^3}{773K \cdot \frac{8.314 \frac{kJ}{kmol \cdot K}}{50 \frac{kg}{kmol}}} = \underline{3.42 \, g = m_{G_1}}$$

b)



$$\frac{dE}{dt} = \dot{Q} - \dot{W}$$

$T_{2G} < T_{1G}$ da Wärme verloren \ übertragen wird nach oben,

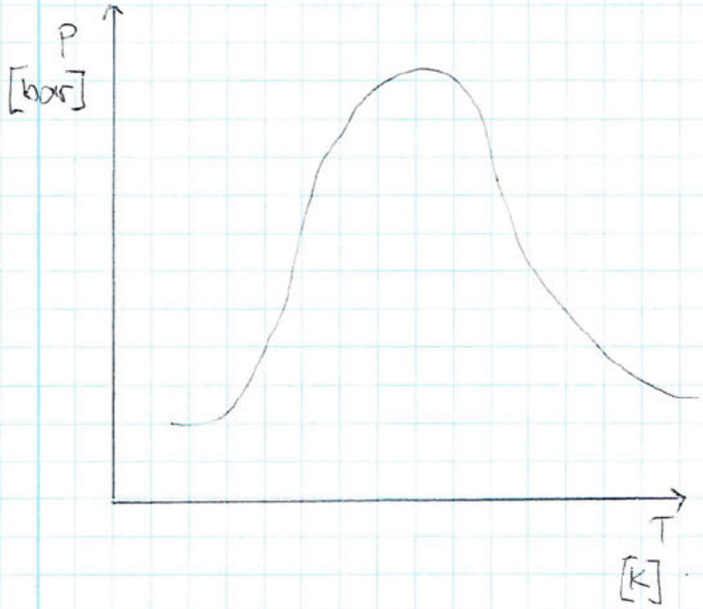
der Druck $p_{2G} = p_{1G}$ da das Volumen den Ausgleich regelt

c) $m_{G_1}(u_2 - u_1) = \dot{Q}_{12} - \dot{W}$

d) $m_K \cdot g + p_0 \cdot A + m_{EW_2} = p_{G2} \cdot A$

$$\frac{u_2(p_2, T_{2EW}) - u_f(p_2, T_{2EW})}{u_g(p_2, T_{2EW}) - u_f(p_2, T_{2EW})} = x_{2eis}$$

4. a) TPP: bei 6 bar & 0°C [redacted]



b)

c) Drossel ⇒ isenthalp

$h_1 = h_4$, $h_4 = h_f = 93{,}42 \frac{kJ}{kg}$

$x_1 = \frac{h_1 - h_f}{h_g - h_f} \rightarrow \underline{x_1 = 0}$