1) a) $\dot{Q}_{aus}$ ges

$$0 = \dot{m}_k [h_e - h_a] + \dot{Q}_R - \dot{Q}_{aus}$$

$h_e = h(70°$

$h_a = h(100°$

b) $0 = \dot{m} (s_e - s_a) +$ $\dot{Q}_{aus}$

c) $\dot{S}_{erz} = \dot{m} [s_a - s_e] - \frac{\dot{Q}_J}{T_J}$ $\dot{Q}_{aus}$ $\overline{T}_{KE}$

[redacted]

$0.220 \frac{kW}{K}$

c)

$$\Delta E = \Delta U = Q - W \quad \Rightarrow Q = \Delta U + W = -1229.183\,J$$

$$\Delta U = m c_v (T_2 - T_1) = -1139.393\,J$$

(3.6)

$$W = \frac{R(T_2 - T_1)}{1-n} \cdot m = -89.789\,J$$

(3.6; $n = 0$ = isobar)

d) $x_{Eis,2}$ ges.

Thermodyn. Gleichgewicht mit Gas

$$x_{Eis} = \frac{m_{Fest}}{m_{Fest} + m_{Flüssig}}$$

(0.003 °C; 0.997)

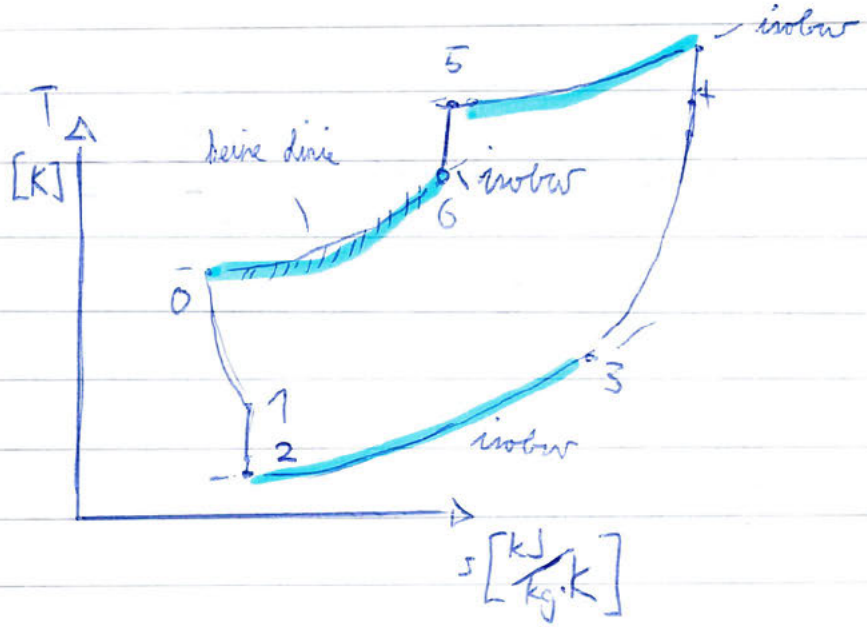
$$u_2 - u_1 = c_v (T_2 - T_1) \Rightarrow u_2 = -200.093\,kJ/kg$$

$$u_1 = x \cdot u_{Fest,0°} + (1-x) \cdot u_{Fl,0°} = -200.093\,kJ/kg$$

$$u_2 = x \cdot u_{Fest,0.003°C} + (1-x) \cdot u_{Fl,0.003°C}$$

$\Rightarrow x = 0.600$

2 a)



b) w_6, T_6 ges.

$p_6 = p_1$

$$\dot{m} = \frac{\dot{V}}{v} = \frac{A \cdot w}{v}$$

$$p \cdot \dot{V} = \dot{m} R \cdot T$$

$$\frac{T_6}{T_5} = \left(\frac{p_6}{p_5}\right)^{\frac{n-1}{n}} \qquad n = k = 1{,}4$$

$\Rightarrow T_6 = 328{,}07\,K$

$$v = \frac{A_1 w_1}{\dot{m}}$$

c) $\dot{m}_{Ges}$ $\qquad c_p(T_2 - T_1) = 243.15\,K \qquad \left|\frac{w_6^2}{2} - \frac{w_1^2}{2}\right|$

$$0 \quad -\Delta e_{x,str} = \dot{m}\left[(h_e - h_a) - T_0(s_e - s_a) + ke\right]$$

$\dot{m}_{ges}$

$$s_e - s_a = c_p \ln\left(\frac{T_e}{T_a}\right) - \underbrace{R \ln\left|\frac{p_e}{p_a}\right|}_{=0} = -0{,}301\ \frac{kJ}{kgK}$$

$$\dot{m}_{Ges} \Rightarrow 0 = \dot{m}_{Ges}\left[h_5 - h_6 + \frac{w_5^2 - w_6^2}{2}\right]$$

$$h_5 - h_6 = c_p(T_5 - T_6)$$

$$0 = \dot{m}_{Ges}\underbrace{[h_0 - h_5]}_{c_p(T_0 - T_5) = -189.8825} + q_B \cdot \dot{m}_K + \dot{m}_{Ges}\underbrace{\left[\frac{w_0^2 - w_5^2}{2}\right]}_{-9200}$$

$\Rightarrow \dot{m}_{Ges}$

$$\dot{m}_{Ges} - \dot{m}_M = \dot{m}_K$$

$$(\dot{m}_{Ges} - 5.293)\,\dot{m}_K = \dot{m}_K$$

$$\dot{m}_{Ges} = 6.293\,\dot{m}_K$$

$$\frac{\dot{m}_{Ges}}{6.293}$$

3) a) $p_{G,1}$, m_G ges

$p \cdot V = m \cdot R \cdot T \Rightarrow m_G = \frac{p \cdot V}{R \cdot T}$ $\quad V = 0.00314\,L$, $T = 773.15\,K$

$R = \frac{\bar{R}}{M} = 166.28 \frac{J}{kg\,K}$ $\quad M = 0.050\,kg/mol$

$\Rightarrow m = 2.687\,g$

$p_G \cdot A = p_0 \cdot A + m_k \cdot g \Rightarrow p_G = 1.100\,bar$

$A = (0.1\,m)^2 \cdot \pi$

b) $p_{0,1} = 1.5\,bar$, $m_G = 3.6\,g$

$p \cdot V = m \cdot R \cdot T$

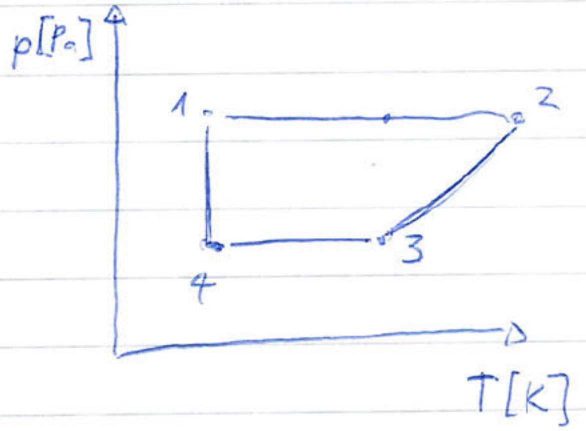
$p_2 = p_1 \Rightarrow$ Der Druck muss gleich bleiben, da das System im Gleichgewicht ist und sich weder das Gewicht des Kolbens noch der Luftdruck verändert

$T = \frac{p \cdot V}{m \cdot R}$

Da p gleich bleibt, da

[redacted]

4)



b) $\dot{m}_{R134a}$ ges

$0 = \dot{m}[h_2 - h_3] + \dot{W}_K \Rightarrow \dot{m} = 0.827$ kg/h (A-10) $s_2 = 0.9298$

$h_2 = h(x_2 = 1)$, $T = T_i - 6K$, $p_2 = p_1$ $h = 237.97$

$h_3 = h(8 bar, s_2)$ $-10°C \Rightarrow = -16°C$ $h =$

(A-12)

c) x_1 ges

$x_4 = 0$ $T_i = -10°C$ $h = s_{sat} + \frac{h_{40} - h_{sat}}{s_{40} - s_{sat}} (s_2 - s_{sat})$

$x_1 =$

$h = 271.313$

$0 = \dot{m}[h_4 - h_1]$

$\Rightarrow h_1 = h_4$ $x_4 = 0$,

4)

d) $\varepsilon_K = \frac{|\dot{Q}_{zu}|}{|\dot{Q}_{ab}| - |\dot{Q}_{zu}|} = \frac{|\dot{Q}_K|}{|\dot{Q}_{AB}| - |\dot{Q}_K|} = 0.02$

$|\dot{Q}_K| - |\dot{Q}_{AB}| + |\dot{W}_K| = 0 \Rightarrow |\dot{Q}_K| = |\dot{Q}_{AB}| - |\dot{W}_K| = 0.652\,kW$ //

$0 = \underbrace{\dot{m}}_{4\,t/h} \underbrace{[h_3 - h_4]}_{271.313} - |\dot{Q}_{AB}| \Rightarrow |\dot{Q}_{AB}| = 28.652\,kW$ //

$h_4 = h(x_4 = 0, p_4 = 8_{bar}) = 264.15$