Nr. 1

$\dot{m}_{ein} = 0.3 \frac{kg}{s}$

$\dot{Q}_j = \dot{m}(h_a - h_e) = \dot{m}(h_2 - h_1)$

h_a $T = 70°C$ $x = 1$

TA2 $h_1 = 2626.8 \frac{kJ}{kg}$

h_2 ~~$x = 0.005$~~ $\Rightarrow$ $T = 100°C$ TA2

$h_2 = 2676.1 \frac{kJ}{kg}$

~~$100°C \; h = h_f + x(h_g - h_f)$~~

$\dot{Q} = \dot{m}(u_2 - u_1) + \dot{m}(h_2 - h_1)$

$\dot{Q} = 16,79\ kJ$

↳ 0 a bei a Aufgabe 3

(b) $\overline{T}_{EF} = \dfrac{\cancel{c_f h}\ \cancel{c_f}(T_2 - T_1)}{\cancel{c_f h}\ln\left(\frac{T_2}{T_1}\right)} = 293,12$

(c)

Nr. 2

[redacted]

(b) ~~$p_5 = p_6$~~ $p_6 = 1$

$$\frac{T_6}{T_5} = \left(\frac{p_6}{p_5}\right)^{\frac{0.4}{1.4}}$$

$$T_6 = \left(\frac{p_6}{p_5}\right)^{\frac{0.4}{1.4}} T_5$$

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

$$w_{5,6} = \frac{R\,(T_6 - T_5)}{-0.4} = \text{[illegible]} \quad 7874{,}498\ \frac{kJ}{kg}$$

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

$$M = 28{,}97\ \frac{kg}{kmol}$$

$$R = 287\ \frac{J}{kgK}$$

$$w_t = h_e - h_a + \frac{w_e^2 - w_a^2}{2} \quad |\cdot 2$$

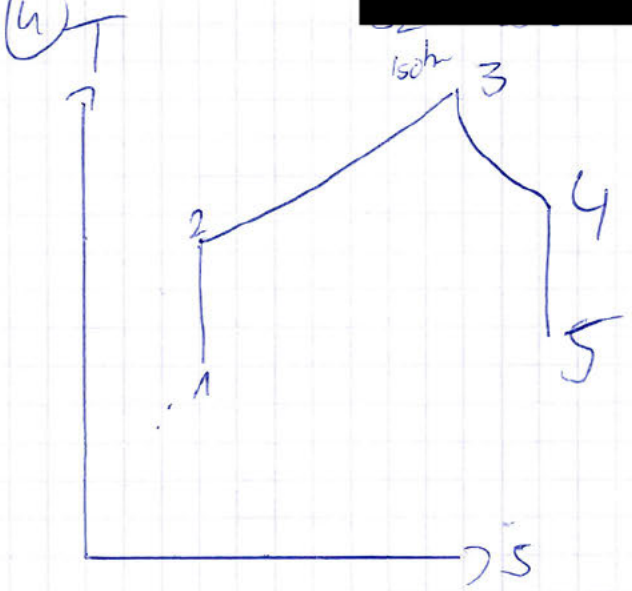
~~$w_t + h_6$~~

$$w_A^2 = 2h_5 - 2h_6 + w_e^2 - 2w_t$$

$$w_A^2 = 2c_p\,(T_5 - T_6) + \left(200\,\frac{m}{s}\right)^2 - 2w_t$$

$$w_6 = 316\,m$$

(a)



2.

c) ~~$\dot{m}_{Gas}$~~ $\Delta ex,str = (h_6 - h_0 - T_0(s_6 - s_0) + \frac{1}{2} w_6^2 - \frac{1}{2} w_0^2)$

$\dot{m}_{Gs} =$

~~$\Delta ex,st$~~

$\dot{m}_L + 5.293$

$\dot{m}_M = 5.293 \dot{m}_L \quad \Delta ex,st = \left(cp(T_6 - T_0) - T_0 \left(cp \left(ln\left(\frac{T_6}{T_0}\right) - R \cdot ln\left(\frac{p_0}{p_0}\right) \right) + \frac{w_6^2 - w_0^2}{2} \right) \right|$

T_6, w_6 von

Lösungen: $\Delta ex,t = 144,13 \frac{kJ}{kg} + 110,050 \frac{kJ}{kg} = 249,18 \frac{kJ}{kg}$

d) ~~$Q = E_{x,st}$~~ $E_{x,vl} = T_0 \cdot S_{erz}$

$S_{erz} = \dot{m}(s_2 - s_1) - \frac{\dot{Q}_j}{T_j} \quad | : \dot{m}$

$S_{erz} = \dot{m}_{Gs}(s_6 - s_{10}) - \frac{q}{T_j}$

$\dot{m}_{Gs} = (\dot{m}_M + 5.293)$ $= \dot{m} cp(T_2 - T_1) - \frac{1105,5,293 \dot{m}}{k_j}$

~~S_{erz}~~ $\dot{S}_{erz} = 367,51 \frac{kW}{K}$

~~$\dot{m}_{Gs} = (\dot{m}_L \cdot 5.293$~~

~~S_{erz}~~ $T_0 \cdot E_x = 89,312 kW$

~~$\dot{m}_L =$~~

~~$\dot{m}_L = 5.293$~~

$\dot{m}_{Gs} = \dot{m}_M (1 + 5.293 m_L)$

[redacted]

(N.3)

$$p_1 = 1\,bar + \frac{(m_K + m_{EW}) \cdot g}{\frac{(0.1m)^2 \cdot \pi}{4}}$$

$$p_1 = 1bar + 0,40094\,bar$$

$$= 1,4\ bar$$

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

$$m = \frac{p \cdot V}{R \cdot T} = ~~0,~~ 3,42\ g$$ ✓

(b) => ~~iso isochor = Volum~~ verändert sich nicht; ~~Masse auch nicht~~

Masse verändert sich nicht

$Q=0$ ~~$m_G(u_2-u_1) = m_{EW}(u_1-u_2)$~~ $m_G(u_2-u_1)+m_{EW}(u_2-u_1)=0$

(c)

$$Q_{12} = m(u_2-u_1)$$

=Werte in Aufgabe geändert

$$Q_{12} = m \cdot 0.633 \frac{kJ}{kg \cdot K}(T_2-T_1)$$

$$Q_{12} = -1\ 082,183$$

(d)

Zustand 2 $Q=0$

$m_G(u_2-u_1) = m_{EW}(u_2-u_1)$

$m_G \cdot (c_v(T_2-T_1) = m_{cW}(u_2-u_1)$

~~$=1\,139,39$~~

$-11,393,93\,\frac{kJ}{kg} = u_2-u_1$

$x_1=0,6 \quad u_1=-133,41$

$u_1 = -166\,\frac{kJ}{kg}$

Interpolation bei $p=$ ~~0.003~~ $= x = \frac{-166-u_f}{u_g-u_f}$

$x = 560,568$

Nr. 1 (d)

(d) $T_{R12}=70°C$

$m_1 = 5755kg$

$m_2 = (m+m_{rein})$

~~Δm_{12}~~

$T_{Pi} = 20°C$

$x=1$

$Q = m_2 \cdot u_2 - m_1 u_1 - m_{rein} \cdot h$

$Q = m_{rein} \cdot u_2 + m_1(u_2-u_1) - m_{rein} \cdot h$

$m_{rein} = \frac{Q - m_1(u_2-u_1)}{u_2-h} =$ ~~Q_{Anfang}~~

TA2 $u_1 = T_{100} \; 100°C \quad x=0.005$

TA20

$u_1 = 429,38\,\frac{kJ}{kg}$

$h_{rein} = 2538.1\,\frac{kJ}{kg}$

$u_2 = T(70) = 2469,6\,\frac{kJ}{kg}$

$Q = m_{ges} h$

$Q = (m_1 + m_{rein}) \cdot u -$

$m_{rein} =$ ~~$682,357$~~

~~$Q + m_1 u_1 = 2538.1\,\frac{kJ}{kg}$~~

$\Delta m = 682,357$

Nr. 4

	p (bar)	T (K)	Q	W	x	
1	~~p=p₂~~ 1,2 (10) $p_1 = p_2$					~~$s_1 = s_4$~~ $h_1 = h_4$
2	$p_1 = p$	T_i = -6 (-22°C) ~~277,15 K~~			1	$s_2 = s_3$
3	8			29 W		$s_2 = s_1$ ~~$s_3 = 0$~~
4	$p_1 = p_4$ 8				0	~~$s_1 = s_4$~~ $h_1 = h_4$ 93,42 kJ/kg

T_i = Icond

$x_4 = 0$

(b) T_{AB} $h_4 = 93,42 \frac{kJ}{kg}$

Tripelpunkt = 10 K ab Sublimationsdruck = 10

~~$T_1 = T_{Tripel} + 10K = 283,15 K$~~

$T_2 =$ $T_1 = T_{Tripel} + 10K = 283,15K - 6K$ $T_2 = 277,15K$

nehme T_2 ~~aus~~ $t_2 = -22°C$

(A10) $s_2 = 0,9351 \frac{kJ}{kg \cdot K}$ $h_2 = 251,8 \frac{kJ}{kg}$

$s_3 = 0,9351 \frac{kJ}{kg \cdot K}$

h_3 inter polin $\quad p = 8\ bar$

$$h_3 = h(sat) + \frac{h(40) - h(sat)}{s(40) - s(sat)} \cdot (s_{g2} - s(sat))$$

$$h_3 = 272{,}95$$

$$-W_{12} = \dot{m}(h_2 - h_3)$$

$$\dot{m} = \frac{-W_{12}}{h_2 - h_3} = 1{,}32\ kg$$

(c) pH $\quad p_1 = 1{,}219\ bar$ T A 10

~~$h_1 = h_4$~~ $\quad p_2 = p_1$, $h_1 = h_4$

$\times 1.2$

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

$$x = \frac{h_4 - h_f}{h_g - h_f} \qquad x = 0{,}3039$$

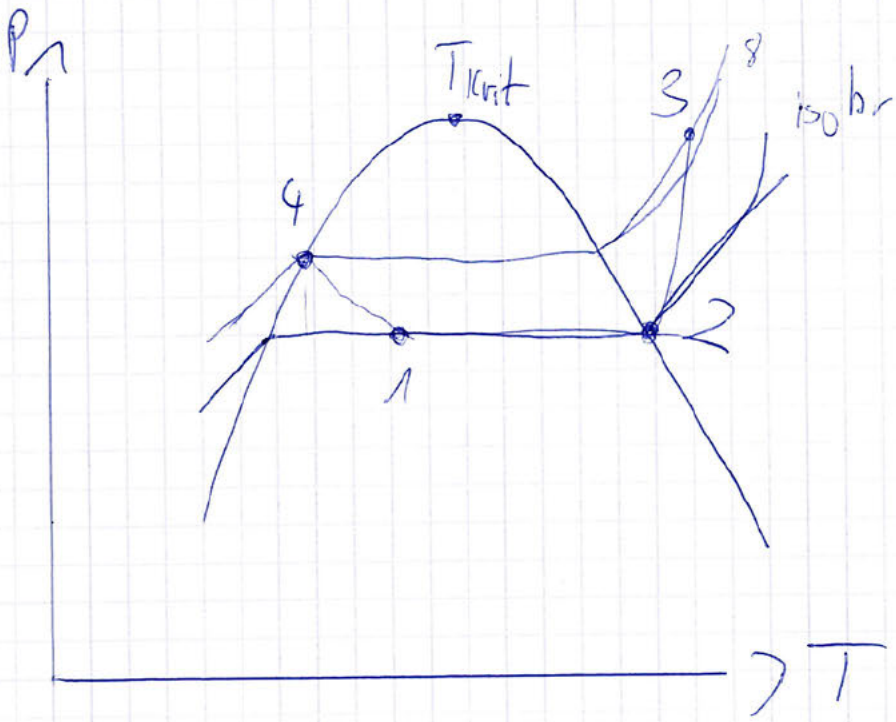
(d) $$\varepsilon_{IC} = \frac{\dot{Q}_{zu}}{Q_{ab} - Q_{zu}} = \frac{\dot{Q}_{zu}}{W_t} = \frac{Q_K}{W_K}$$

$$Q_{IC} = \dot{m}(h_2 - h_1) \qquad \dot{m} \text{ aus der Lösung}$$

$h_1 = 93{,}42\ kJ/kg$, $h_2 = 251{,}8\ kJ/kg$

$$Q_C = \dot{m}\frac{40}{60^2 \cdot 3} \cdot (251{,}8 - 93{,}42)$$

$$= 0{,}46\ kW =$$


p
T krit
3
8
isob.
4
2
1
T

$$\varepsilon_{(} = \frac{176\,\text{kW}}{28\,\text{W}} = 6{,}285\,?$$

[redacted]

e) => Würde das was man versucht zu tun, da W Wärme entzogen wird, wird es schwerer W werden die in die Gasphase zu überführen

e) ~~$S_{12} = S_2 - S_1$~~

$\Delta S_{12} = m_{Gas} \cdot s_2 - m_1 \cdot s_1 -$

~~$S_1 =$~~

TA2 $T_1 = 100$

$s = 1{,}337\,14\ kJ/kg$

$s_2 = s_3 = 7.7533$

~~$\Delta S_{12} = 4813 - \frac{3511}{295K}$~~

$= 4811$

$\Delta S_{12} = 4813$ J)