

## 1. Reaktor

a.) ges.:  $\dot{Q}_{\text{aus}}$

geg.:  $\dot{m}_{\text{ein}} = 0.3 \frac{\text{kg}}{\text{s}}$ ,  $T_{\text{ein}} = 70^\circ\text{C}$   
 $T_{\text{aus}} = 100^\circ\text{C}$

$\dot{m}_{\text{ges}} = 5755 \text{ kg}$ ,  $T_R = 100^\circ\text{C}$ ,  $\dot{Q}_R = 100 \text{ kW}$   
 $\Delta T_{\text{KF}} = T_{\text{KF,aus}} - T_{\text{KF,ein}} = 10 \text{ K}$

$$\dot{Q}_{\text{aus}} = \dot{Q}_R \cdot \frac{T_{\text{ein}}}{T_{\text{aus}}} = 100 \text{ kW} \cdot \frac{70^\circ\text{C}}{100^\circ\text{C}} = \underline{\underline{70 \text{ kW}}}$$

b.)

$$\bar{T}_{\text{KF}} = \frac{T_{\text{KF,aus}} + T_{\text{KF,ein}}}{2} = \frac{298.15 \text{ K} + 288.15 \text{ K}}{2} = \underline{\underline{293.15 \text{ K}}}$$

c.)

$$= \frac{\int_a^b T ds}{s_a - s_b}$$

c.)

$$\dot{S}_{\text{abg}} = -\dot{m}(s_a - s_b) - \sum \frac{\dot{Q}_j}{T_j} = -\frac{65 \text{ kW}}{295 \text{ K}} = \underline{\underline{220.339 \frac{\text{W}}{\text{K}}}}$$

d.)

$$\frac{dE}{dt} = \sum \dot{m}_i(h_i) \left( h_i(t) + k_{e,i}(t) + p_{e,i}(t) \right) + \sum_j \dot{Q}_j(t) - \sum_n \dot{W}_n(t)$$

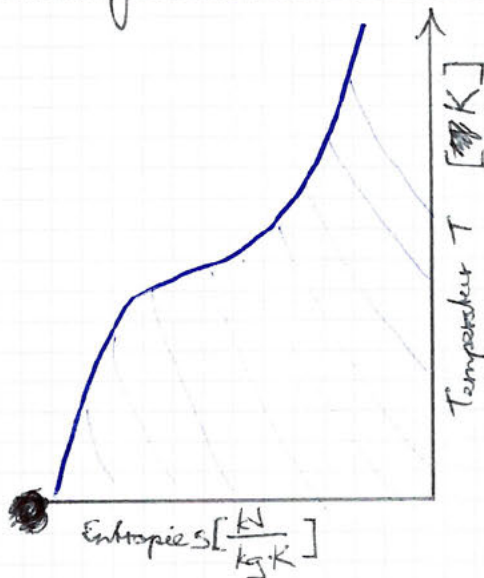
e.)

$$\Delta S_{12} = S_2 - S_1$$



## 2. Energie am Triebwerk

a.)



b)  $\omega_6$ ,  $T_6$ ?

$$\frac{T_2}{T_1} = \left( \frac{p_2}{p_1} \right)^{\frac{n-1}{n}} = \left( \frac{V_1}{V_2} \right)^{n-1}$$

$$n = 1.4$$

~~Alt~~

$$\left( \frac{p_6}{p_5} \right)^{\frac{0.4}{1.4}} = \left( \frac{\omega_5}{\omega_6} \right)^{0.4}$$

$$\left( \frac{0.191 \text{ bar}}{0.5 \text{ bar}} \right)^{\frac{0.4}{1.4}} = \left( \frac{220 \frac{\text{m}}{\text{s}}}{\omega_6} \right)^{0.4} \Rightarrow \underline{\underline{\omega_6 = 437.471 \frac{\text{m}}{\text{s}}}}$$

$$T_6 = T_5 \cdot \left( \frac{p_6}{p_5} \right)^{\frac{0.4}{1.4}} = 431.9 \text{ K} \left( \frac{0.191}{0.5} \right)^{\frac{0.4}{1.4}} = \underline{\underline{328.075 \text{ K}}}$$

c.)  $\dot{E}_{x,\text{str}} = \dot{m} e_{x,\text{str}} = \dot{m} (h - h_0 - T_0 (s - s_0) + ke + pe)$

d.)  $\dot{E}_{x,\text{verl}} = T_0 \dot{S}_{\text{erg}}$



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### 3. Schmelzen von Eis durch perfektes Gas

a.)  $p_{g,1}$ ,  $m_g$

$$pV = n\bar{R}T$$

$$pV = RT$$

$$pV = mRT$$

$$\bar{R} = 8.314 \frac{\text{J}}{\text{mol K}}$$

$$R = \frac{\bar{R}}{M} = 0.16628 \frac{\text{J}}{\text{kg}}$$

$$T_{g,1} = 500^\circ\text{C} = 773.15\text{K}$$

$$V_{g,1} = 3.14\text{L} = 0.00314\text{m}^3$$

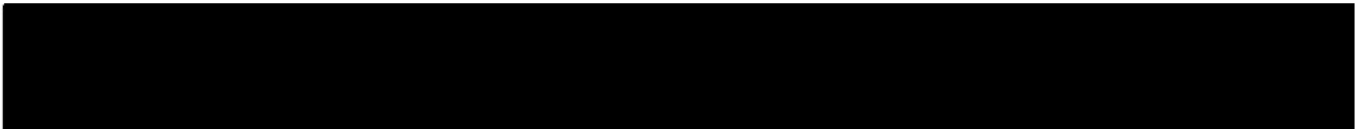
$$p_{g,1} = \frac{mRT}{V} = \frac{0.0036\text{kg} \cdot 0.16628 \frac{\text{J}}{\text{kg}} \cdot 773.15\text{K}}{0.00314\text{m}^3} = \underline{\underline{147.333\text{Pa}}}$$

$$m_g = \frac{pV}{RT} = \frac{1.5 \cdot 10^5 \text{Pa} \cdot 0.00314\text{m}^3}{0.16628 \frac{\text{J}}{\text{kg}} \cdot 773.15\text{K}} = \underline{\underline{3.664\text{g}}}$$

b.)

$$x_{\text{Eis},1} = \frac{m_{\text{Eis}}}{m_{\text{EW}}} = 0.6$$

$$m_{\text{EW}} = 0.4$$

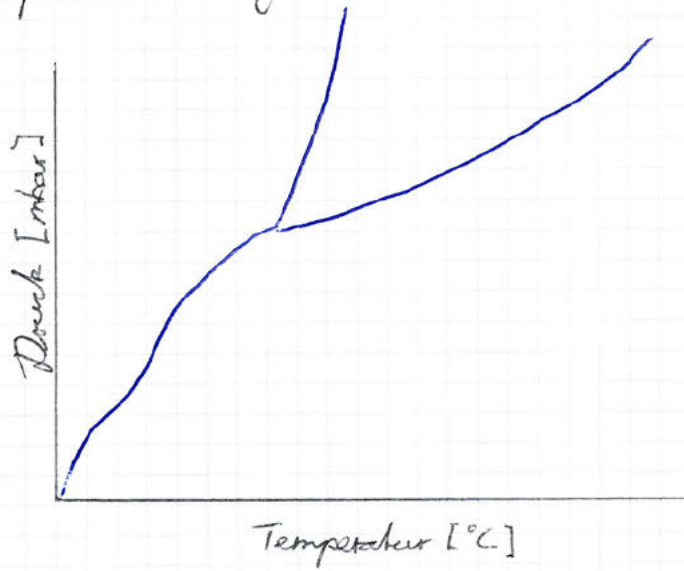


[The following text is extremely faint and largely illegible due to the quality of the scan. It appears to be a multi-paragraph document, possibly a letter or a report, written on lined paper. The text is organized into several distinct paragraphs, separated by line breaks. Some words and phrases are discernible, such as "I am writing to you", "I hope this finds you well", and "I am very grateful for your help", but the majority of the content is lost to the noise and low contrast of the scan. The text is written in a formal, slightly dated style, possibly from the mid-20th century.]



#### 4. Gefriertraktion

a.)



b.)

$$T_i = -10^{\circ}\text{C}$$

