

Aufgabe 1:

a) $\dot{m} = 0,3 \text{ kg/s}$

$$\dot{Q}_{\text{aus}} = \dot{m}(h_{\text{aus}} - h_{\text{ein}}) - \dot{Q}_R$$

Tabelle A2:

$$h_{\text{ein}} = h_f(70^\circ\text{C}) = 292,98 \frac{\text{kJ}}{\text{kg}}$$

$$h_{\text{aus}} = h_f(100^\circ\text{C}) = 419,04 \frac{\text{kJ}}{\text{kg}}$$

$$\dot{Q}_{\text{aus}} = -62,181 \text{ kW}$$

b)

$$\bar{T} = \frac{\int_e^a T ds}{s_a - s_e} = \frac{c_{p,f}(T_a - T_e)}{\ln\left(\frac{T_a}{T_e}\right)} = 293,12 \text{ K}$$

$$T_a = T_{\text{KF,aus}} = 298,15 \text{ K}$$

$$T_e = T_{\text{KF,ein}} = 288,15 \text{ K}$$

Aufgabe 1:

c)

$$0 = \dot{m}_{\text{ein}} (s_e - s_a) + \frac{\dot{Q}_{\text{aus}}}{\bar{T}_{\text{KF}}} + \frac{\dot{Q}_R}{\bar{T}_R} + s_{\text{erz}}$$

$$s_{\text{erz}} = \cancel{\dot{m}_{\text{ein}} (s_a - s_e)} - \frac{\dot{Q}_{\text{aus}}}{\bar{T}_{\text{KF}}} - \frac{\dot{Q}_R}{\bar{T}_R}$$

$$s_{\text{erz}} = - \frac{\dot{Q}_{\text{aus}}}{\bar{T}_{\text{KF}}} = 0,212 \frac{\text{kJ}}{\text{kg}} \text{ K}$$

d)

$$m_2 u_2 - m_1 u_1 = \Delta m_{12} h_{\text{ein}}$$

Tabelle A-2 für u_{1f} , u_{1g} , $u_f (70^\circ\text{C})$, h_{ein}

$$u_{1f} = 418,94 \frac{\text{kJ}}{\text{kg}} \quad u_{1g} = 2506,4 \frac{\text{kJ}}{\text{kg}}$$

~~$u_{1f} = 418,94$~~

$$u_1 = u_{1f} + x_D (u_{1g} - u_{1f}) = 429,38 \frac{\text{kJ}}{\text{kg}}$$

$$u_2 = u_f (70^\circ\text{C}) = 292,95 \quad h_{\text{ein}} = 83,96 \frac{\text{kJ}}{\text{kg}}$$

$$m_2 = \Delta m_{12} + m_1$$

$$\Delta m_{12} u_2 + m_1 (u_2 - u_1) = \Delta m_{12} h_{\text{ein}}$$

$$\frac{m_1 (u_2 - u_1)}{h_{\text{ein}} - u_2} = \Delta m_{12}$$

$$\Delta m_{12} = 3756,9 \text{ kg}$$

Aufgabe 1:

e)

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

Tabelle A-2:

$$s(100^\circ\text{C})_f = 1,3069 \frac{\text{kJ}}{\text{kg}} \quad s(100^\circ\text{C})_g = 7,3545 \frac{\text{kJ}}{\text{kg}} \quad \text{K}$$

$$s(70^\circ\text{C})_f = 0,955 \frac{\text{kJ}}{\text{kg}} \quad \text{K}$$

$$s_1 = s_f + x_0 (s_g - s_f) = 1,337 \frac{\text{kJ}}{\text{kg}} \quad \text{K}$$

$$s_2 = 0,955 \frac{\text{kJ}}{\text{kg}} \quad \text{K}$$

$$\Delta S_{12} = S_2 - S_1 = -0,382 \frac{\text{kJ}}{\text{kg}} \quad \text{K}$$

Aufgabe 3

c)

$$T_{G1} = 500^{\circ}\text{C} \quad T_{G2} = 0,003^{\circ}\text{C}$$

$$\dot{m}_{cv} (T_2 - T_1) = Q_k$$

$$Q_k = 0,85 \text{ kJ}$$

d)

$$u_{1EW} = u(3\text{ bar}, 0^{\circ}\text{C})$$

$$u_{1EW} = u_{\text{fest}} + x_{Eis} u_{\text{flüssig}} + x_{Eis} (u_{\text{fest}} - u_{\text{flüssig}})$$

$$u_{1EW} = -200,0928$$

$$m_w (u_{2EW} - u_{1EW}) = Q_k$$

$$u_{2EW} = \frac{Q_k}{m_w} + u_{1EW}$$

$$u_{2EW} = -191,6$$

$$-191,6 = -0,033 + x_{Eis} (-333,442 + 0,033)$$

$$x_{Eis_2} = \underline{\underline{0,575}}$$

Aufgabe 3:

a)

$$A_{\text{Zylinder}} = \cancel{0,1 \text{ m}^2} \cdot \pi = 0,0314 \text{ m}^2$$

$$p = \frac{N}{\text{m}^2}$$

$$\begin{aligned} F_{\text{ausgen}} &= 10^5 \text{ Pa} \cdot 0,0314 \text{ m}^2 + 32 \text{ kg} \cdot 9,81 \text{ m/s}^2 \\ &= 3455,5 \text{ N} \end{aligned}$$

$$F_{\text{innen}} \cdot A_{\text{Zylinder}} = 3455,5 \text{ N}$$

$$\text{Pinnen } p_{G1} = \underline{1,1 \text{ bar}}$$

$$M = 50 \frac{\text{kg}}{\text{kmol}}$$

$$R = \frac{\bar{R}}{M} = 166,28 \frac{\text{J}}{\text{kg} \cdot \text{K}}$$

$$\frac{pV}{RT} = m_{g1} = \underline{2,687 \text{ g}}$$

b)

$$\bar{E}_1 = \bar{E}_2$$

$$\Delta E_{12g} = \Delta E_{12w}$$

$$m_g c_v (T_2 - T_1) = \Delta E_{12w} = m_w (u_2 - u_1)$$

1. *Chlorophyll a* (Chl *a*)

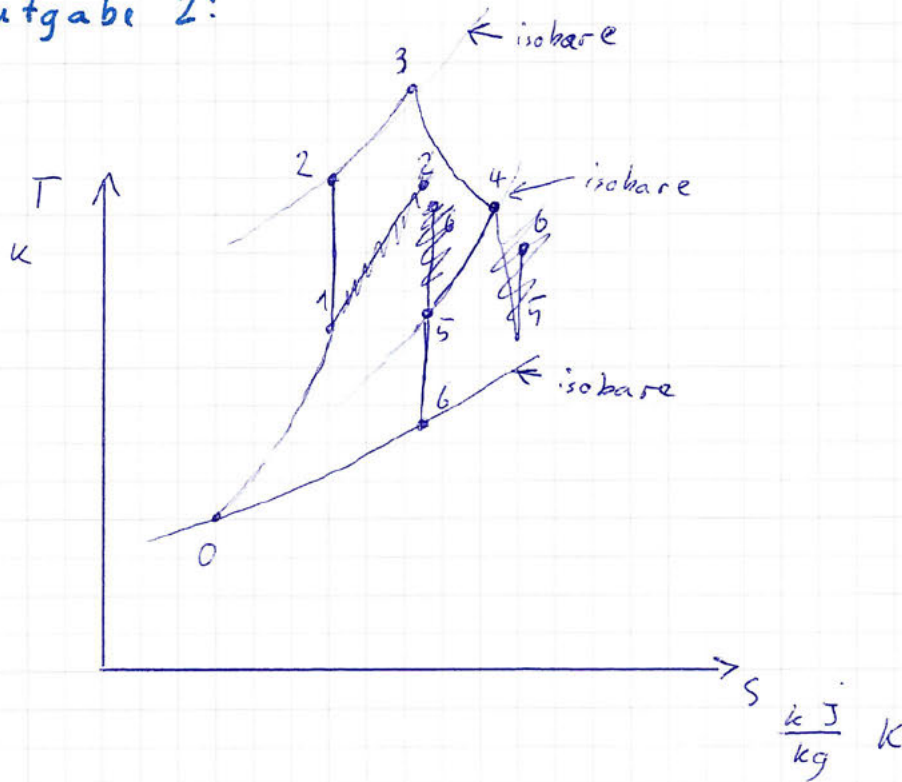
[illegible]

Figure 1. The effect of the concentration of the *Agaricus bisporus* spores on the growth of *Agaricus bisporus* and *Agaricus bisporus* spores on the growth of *Agaricus bisporus*.

Figure 1. The effect of the concentration of the *Agrobacterium* suspension on the transformation efficiency of *Agrobacterium* strains. The number of transformed cells was determined by the number of colonies obtained on the selective medium. The results are the mean of three independent experiments. Error bars represent the standard deviation.

Aufgabe 2:

a)



b) $w_5 = 220 \text{ m/s}$

$p_5 = 0,5 \text{ bar}$

$p_6 = 0,191 \text{ bar}$

$T_5 = 431,9 \text{ K}$

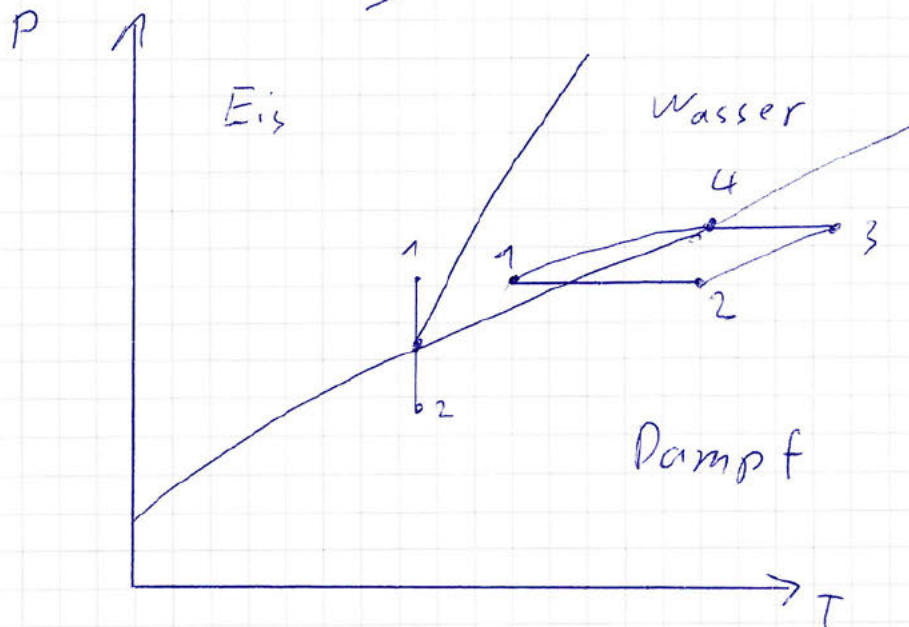
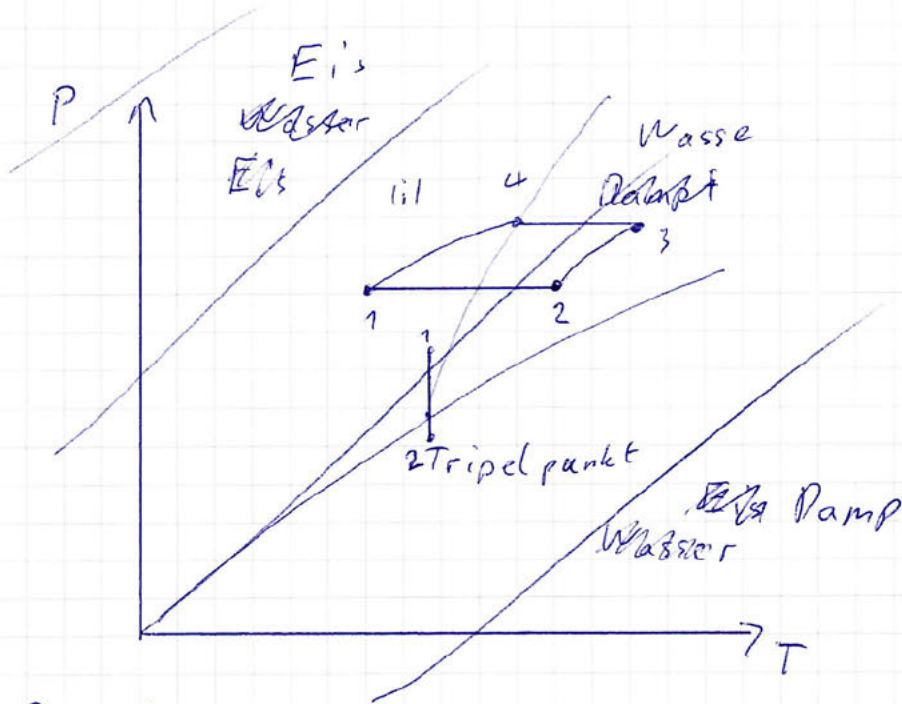
$\kappa = 1,4$

$$\frac{T_6}{T_5} = \left(\frac{p_6}{p_5} \right)^{\frac{\kappa-1}{\kappa}}$$

$T_6 = 328,075 \text{ K}$

Aufgabe 4:

a)



b)

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

$$\bar{T}_H = -16\text{K} \quad \bar{T}_V = -16\text{K}$$