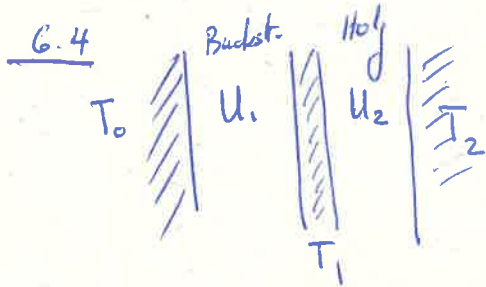


# Wärme/transport

6.3  $P = A \cdot J = -A \lambda \frac{\Delta T}{\Delta x} = -1 \text{ cm}^2 \cdot 390 \frac{\text{W}}{\text{mK}} \cdot \frac{(0^\circ\text{C} - 98^\circ\text{C})}{20 \text{ cm}} = \underline{\underline{19 \text{ W}}}$

$P \cdot \Delta t = L_f \cdot m \Rightarrow \Delta t = \frac{L_f \cdot m}{P} = \frac{L_f \cdot m \cdot \Delta x}{A \lambda |\Delta T|} = \frac{333800 \frac{\text{J}}{\text{kg}} \cdot 0.1 \text{ kg}}{19 \text{ W}} = 1.75 \cdot 10^3 \text{ s}$   
 $= \underline{\underline{29 \text{ min.}}}$



a)  $J = U_1 (T_1 - T_0) = U_2 (T_2 - T_1)$

$\Rightarrow T_1 (U_1 + U_2) = U_1 T_0 + U_2 T_2$

$T_1 = \frac{U_1 T_0 + U_2 T_2}{U_1 + U_2} = \frac{1.15 \frac{\text{W}}{\text{m}^2\text{K}} \cdot (-8^\circ\text{C}) + 0.5 \frac{\text{W}}{\text{m}^2\text{K}} \cdot 20^\circ\text{C}}{(1.15 + 0.5) \frac{\text{W}}{\text{m}^2\text{K}}}$

$T_1 = \underline{\underline{+0.48^\circ\text{C}}}$        $0.48^\circ\text{C}$        $0.5^\circ\text{C}$

(b)  $J = U_{\text{eff}} (T_2 - T_0) \Rightarrow U_{\text{eff}} = \frac{J}{T_2 - T_0} = \frac{U_1 (T_1 - T_0)}{T_2 - T_0} = \frac{U_1}{T_2 - T_0} \left[ \frac{U_1 T_0 + U_2 T_2}{U_1 + U_2} - T_0 \right]$   
 $= \frac{1.15 \frac{\text{W}}{\text{m}^2\text{K}}}{2.8^\circ\text{C}} [ +0.48^\circ\text{C} - (-8^\circ\text{C}) ] = \underline{\underline{0.35 \frac{\text{W}}{\text{m}^2\text{K}}}}$

6.5  $\lambda_{\text{max}} = \frac{b}{T} = \frac{2.8977685 \cdot 10^{-3} \text{ km}}{5778 \text{ K}} = \underline{\underline{501.5 \text{ nm}}}$       (~~6.6~~)       $0.35 \frac{\text{W}}{\text{m}^2\text{K}}$   
 Blau-Grün

6.6  $0^\circ\text{C} \hat{=} 273.15 \text{ K}$        $\lambda_{\text{max}}^{0^\circ\text{C}} = \frac{b}{T} = 10.6 \mu\text{m}$   
 $100^\circ\text{C} \hat{=} 373.15 \text{ K}$        $\lambda_{\text{max}}^{100^\circ\text{C}} = \frac{b}{T} = 7.8 \mu\text{m}$        $\rightarrow$  Umgebung:  $\lambda = 7 - 11 \mu\text{m}$   
 (Mid-IR)

6.7  $J_s = \left( \frac{R_0}{r} \right)^2 \cdot \frac{1}{4\pi} = \left( \frac{695.7 \text{ km}}{149.6 \cdot 10^6 \text{ km}} \right)^2 \frac{5.67 \cdot 10^{-8} \frac{\text{W}}{\text{m}^2\text{K}^4}}{(5778 \text{ K})^4} = \underline{\underline{1367 \text{ W/m}^2}}$

6.8  $P = \eta_z \cdot r \cdot J_s \cdot A = 0.15 \cdot 0.75 \cdot 1367 \frac{\text{W}}{\text{m}^2} \cdot 1 \text{ m}^2 = \underline{\underline{154 \text{ W}}}$

6.9  $\sigma T^4 A = J_s \cdot A \Rightarrow T = \sqrt[4]{\frac{J_s}{\sigma}} = \sqrt[4]{\frac{1367 \text{ W/m}^2}{5.67 \cdot 10^{-8} \text{ W/m}^2\text{K}^4}} = 394 \text{ K} \hat{=} \underline{\underline{121^\circ\text{C}}}$



Wärme Absorbierung auf Boden:



$\sigma T^4 A \cdot 2 = J_s A \Rightarrow T = \sqrt[4]{\frac{J_s}{2\sigma}} = 331 \text{ K} \hat{=} \underline{\underline{58.2^\circ\text{C}}}$

7.5/Offmenge etc

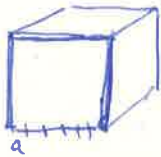
7.1  $N = \mu \cdot V \cdot N_A = 9 \cdot 10^{-3} \frac{\text{mol}}{\text{L}} \cdot 5.5 \text{ L} \cdot 6.022 \cdot 10^{23} \text{ mol}^{-1} = \underline{\underline{3.0 \cdot 10^{22}}}$

7.2 FoTa  $M_a^{\text{Au-197}} = 196.966552 \text{ u} = \underline{\underline{3.27071 \cdot 10^{-25} \text{ kg}}}$

7.3  $m = 1 \text{ kg H}_2\text{O}$   $M_{\text{H}_2\text{O}} = 2M_{\text{H}} + M_{\text{O}} = 2 \cdot 1.00794 + 15.9994 = 18.015 \text{ g/mol}$

$n = \frac{m}{M} = \frac{m_{\text{H}_2\text{O}}}{2M_{\text{H}} + M_{\text{O}}} = \frac{1000 \text{ g}}{18.015 \text{ g/mol}} = \underline{\underline{55.5 \text{ mol}}}$

7.4



$\rho = \frac{m}{V}$ ,  $V = Na^3$

$\rho = \frac{m}{Na^3} = \frac{m}{N_A n a^3} = \frac{M}{N_A a^3} \Rightarrow a = \sqrt[3]{\frac{M}{N_A \rho}} =$

$a = \sqrt[3]{\frac{26.98153 \text{ g/mol}}{6.022 \cdot 10^{23} \text{ mol}^{-1} \cdot 2.7 \text{ g/cm}^3}} = 2.55 \cdot 10^{-10} \text{ m} = \underline{\underline{3 \text{ \AA}}} = 255 \text{ pm}$

$= \sqrt[3]{\frac{26.98153 \text{ g/mol}}{6.022 \cdot 10^{23} \text{ mol}^{-1} \cdot 2.7 \frac{\text{g}}{\text{cm}^3}}} = 2.68 \cdot 10^{-10} \text{ m} = 268 \text{ pm} \approx 3 \text{ \AA}$

7.5  $a = \sqrt[3]{\frac{M}{\rho \cdot N_A}} = \sqrt[3]{\frac{29 \text{ g/mol}}{1293 \text{ g/m}^3 \cdot 6.022 \cdot 10^{23} \text{ mol}^{-1}}} = \underline{\underline{3.3 \text{ nm}}} = 3300 \text{ pm} = \underline{\underline{33 \text{ \AA}}}$

$\rho_{\text{Luft}} = 1.293 \text{ kg/m}^3$  (FoTa 187)

$M_{\text{Luft}} = 23\% \cdot 2 \cdot M_{\text{O}} + 76\% \cdot 2 \cdot M_{\text{N}} + 1\% M_{\text{Ar}} = 29.05 \text{ g/mol}$

$= 0.23 \cdot 2 \cdot 15.9994 + 0.76 \cdot 2 \cdot 14.0067 + 0.01 \cdot 39.948 = 29.05 \text{ g/mol} = 29 \text{ g/mol}$