

$$2.) \Delta T = 75^\circ\text{C}$$

$$\Delta d = 2,3 \cdot 10^{-5} \text{ m}$$

$$1.) d_0 = 1,8 \cdot 10^{-2} \text{ m}$$

$$L = ?$$

$$d = d_0 (1 + L \cdot \Delta T)$$

$$d = d_0 + d_0 L \Delta T$$

$$d - d_0 = d_0 L \Delta T$$

$$L = \frac{d - d_0}{d_0 \cdot \Delta T} = \frac{\Delta d}{d_0 \cdot \Delta T} =$$

$$L = \underline{1,7 \cdot 10^{-5} \text{ K}^{-1}}$$

$$3.) \Delta l = 19,4 \text{ cm}$$

$$t_1 = -9^\circ\text{C}$$

$$t_2 = 41^\circ\text{C}$$

$$\Delta T = 50^\circ\text{C}$$

$$l_1 = ?$$

$$L = 1,2 \cdot 10^{-5} \text{ K}^{-1}$$

$$l_t = l_0 (1 + L \cdot \Delta T)$$

$$l_{-9} = l_0 (1 + L \cdot (-9))$$

$$l_{41} = l_0 (1 + L \cdot 41)$$

$$l_{41} - l_{-9} = l_0 (1 + 41L) - l_0 (1 - 9L)$$

$$\Delta l = 41L l_0 + 9L l_0 = 50L l_0$$

$$l_0 = \frac{\Delta l}{50L} = \underline{323,33 \text{ m}}$$

$$l_{-9} = l_0 (1 + L \cdot (-9)) = \underline{\underline{323,298 \text{ m}}}$$

4.) $t_1 = 28^\circ\text{C}$

$X_1 = 1,3 \text{ mm}$

$l_1 = 2,0 \text{ m}$

$l_2 = 1,0 \text{ m}$

$\alpha_1 = 2,3 \cdot 10^{-5} \text{ K}^{-1}$

$\alpha_2 = 1,9 \cdot 10^{-5} \text{ K}^{-1}$

$t_2 = ?$

$\Delta l = l_0 \alpha \cdot \Delta T$

$\Delta l_1 + \Delta l_2 = 1,3 \cdot 10^{-3}$

$l_1 \cdot \alpha_1 \cdot \Delta T + l_2 \cdot \alpha_2 \cdot \Delta T = 1,3 \cdot 10^{-3}$

$\Delta T (l_1 \alpha_1 + l_2 \alpha_2) = 1,3 \cdot 10^{-3}$

$\Delta T = \frac{1,3 \cdot 10^{-3}}{l_1 \alpha_1 + l_2 \alpha_2} = 21^\circ\text{C}$

$t_2 = t_1 + \Delta t = \underline{49^\circ\text{C}}$

5.) $G = 85,0 \text{ N}$

$\Delta t = -20^\circ\text{C}$

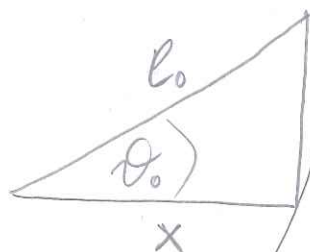
$\alpha = ?$

$\alpha = 2,3 \cdot 10^{-6} \text{ K}^{-1}$

y-os: $N \sin \vartheta + N \sin \vartheta - G = 0$

$2N \sin \vartheta = G$

$N = \frac{G}{2 \sin \vartheta} = \underline{996 \text{ N}}$



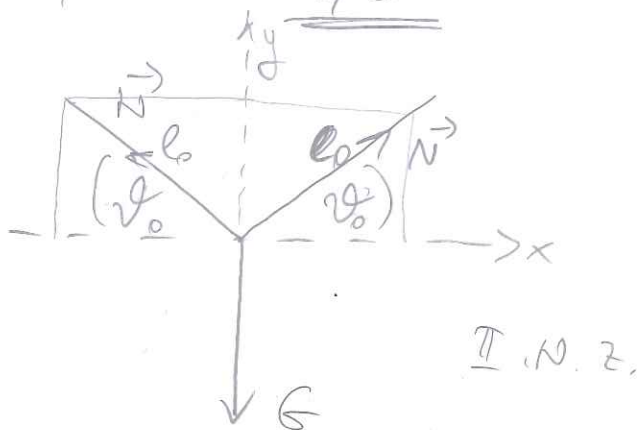
$\cos \vartheta_0 = \frac{x}{l_0}$ (na mrazu temp)

$\cos \vartheta = \frac{x}{l}$ (na mrazu temp)

$\cos \vartheta_0 \cdot l_0 = \cos \vartheta \cdot l \Rightarrow \cos \vartheta = \frac{l_0 \cos \vartheta_0}{l}$

-zbog stvaranja $l = l_0 + \Delta l$, $\Delta l = l_0 \alpha \Delta T$

$\vartheta = 2,446^\circ \Leftarrow \cos \vartheta = \frac{l_0 \cos \vartheta_0}{l_0 + \Delta l} = \frac{l_0 \cos \vartheta_0}{l_0 + l_0 \alpha \Delta T} = \frac{\cos \vartheta_0}{1 + \alpha \Delta T}$



6.) $r_0 = 2,0 \text{ cm}$

$t_1 = 18^\circ\text{C}$

$t_2 = 147^\circ\text{C}$

$\Delta V = ?$

$\beta = 5,2 \cdot 10^{-5} \text{ K}^{-1}$

$V = V_0 (1 + \beta \cdot \Delta T)$

$V = V_0 + V_0 \cdot \beta \cdot \Delta T$

$V - V_0 = V_0 \beta \Delta T$

$\Delta V = V_0 \beta \Delta T = \left(\frac{4}{3} r_0^3 \pi \right) \beta \cdot \Delta T$

$\Delta V = 2,5 \cdot 10^{-7} \text{ m}^3$

7.) $\ell_0 = 76 \text{ m}$

$r_0 = 9,5 \text{ mm}$

$t_1 = 24^\circ\text{C}$

$t_2 = 78^\circ\text{C}$

$V = ?$

$V = \Delta V = \Delta V_{\text{voda}} - \Delta V_{\text{cijevni}} =$

$\Delta V_{\text{voda}} = V_{\text{voda}} \cdot \beta_{\text{voda}} \cdot \Delta T$

$\Delta V_{\text{cijevni}} = V_{\text{cijevni}} \cdot \beta_{\text{cijevni}} \cdot \Delta T \rightarrow \text{isto}$

$\beta_{\text{cijevni}} = 20,7 \cdot 10^{-5} \text{ K}^{-1}$

$\beta_{\text{voda}} = 5,1 \cdot 10^{-5} \text{ K}^{-1}$

$= (\beta_{\text{voda}} - \beta_{\text{cijevni}}) \cdot V_0 \cdot \Delta T$

$= \left\{ V_0 = r^2 \pi \cdot \ell \right\} = \underline{\underline{1,8 \cdot 10^{-4} \text{ m}^3}}$

8.) $m_t = 31,0 \text{ g}$

$c_t = 815 \text{ J/kg} \cdot \text{K}$

$t_{tt} = 12,0^\circ\text{C}$

$m_v = 119 \text{ g}$

$t_k = 41,5^\circ\text{C}$

$t_{iv} = ?$

$\Delta Q_{\text{voda}} = \Delta Q_{\text{term}}$

$-m_v \cdot c_v \cdot \Delta T_v = m_t \cdot c_t \cdot \Delta T_t$

$-m_v \cdot c_v \cdot (t_k - t_{iv}) = m_t \cdot c_t \cdot (t_k - t_{tt})$

$-0,119 \cdot 4186 \cdot (41,5 - t_{iv}) = 0,031 \cdot 815 \cdot (41,5 - 12,0)$

$t_{iv} - 41,5 = 1,48 \Rightarrow \underline{\underline{t_{iv} = 42,98^\circ\text{C}}}$

9.) $Q = 430 \text{ kcal}$

$t_1 = 0^\circ\text{C}$

8.) $t_2 = 37^\circ\text{C}$

$V_v = ?$

$1 \text{ kcal} = 4186 \text{ J}$

$Q = 430 \text{ kcal} =$
 $= 430 \cdot 4186 \text{ J} =$
 $= 1,8 \cdot 10^6 \text{ J}$

$Q = m \cdot c \cdot \Delta T$

$\rho = \frac{m}{V} \Rightarrow m = \rho \cdot V$

$Q = \rho_v \cdot V_v \cdot c_v \Delta T \rightarrow 37$

$V_v = \frac{Q}{\rho_v \cdot c_v \cdot \Delta T} = \frac{1,8 \cdot 10^6 \text{ J}}{1000 \cdot 4186 \cdot 37}$

$V_v = 0,012 \text{ m}^3 = \underline{\underline{12 \text{ L}}}$

10.) $m_k = 0,20 \text{ kg}$

$h = 15 \text{ cm}$

9.) $m_v = 0,35 \text{ kg}$

$c_k = 1840 \text{ J/kg} \cdot \text{K}$

$\Delta t_k = ?$

$E_{gp} = E_k = Q = m_k \cdot c_k \cdot \Delta T + m_v \cdot c_v \cdot \Delta T$

$\Delta T = \frac{E_{gp/k}}{m_k c_k + m_v c_v}$

$\Delta T = \frac{0,2 \cdot 9,81 \cdot 15}{0,2 \cdot 1840 + 0,35 \cdot 4186} =$

$\Delta T = 0,016^\circ\text{C}$

$\rightarrow m_k = \rho_k \cdot V_k = 1000 \cdot 150 \cdot 10^{-6} = \underline{\underline{0,15 \text{ kg}}}$

$\Delta Q_{KAUA} = Q_{LED}^{skr.} + \Delta Q_{LED}$

$-m_k \cdot c_k \cdot (t_{kon} - t_{KAUA}) = m_L \cdot L_k +$
 $m_L \cdot c_v \cdot (t_{kon} - t_{LED})$

$t_{kon} = \underline{\underline{64^\circ\text{C}}}$

11.) $m_k = 150 \text{ cm}^3$

$t_{KAUA} = 85^\circ\text{C}$

10.) $m_L = 11 \text{ g} (\times 2)$

$t_{LED} = 0^\circ\text{C}$

$c_k = c_v = 4186 \text{ J/kg} \cdot \text{K}$

$t_{kon} = ?$

$L_{LED} = 3,35 \cdot 10^5 \text{ J/kg}$

12.) $m_L = 48 \text{ kg}$
 $t_{L1} = 0^\circ\text{C}$

11. $v_1 = 7,3 \text{ m/s}$
 $v_2 = 3,5 \text{ m/s}$

 $m_{L \rightarrow v} = ?$

$$\Delta E_k = W_m = Q = m_{L \rightarrow v} \cdot L_{L \rightarrow v}$$

$$\frac{1}{2} m_L v_2^2 - \frac{1}{2} m_L v_1^2 = m_{L \rightarrow v} \cdot L_{L \rightarrow v}$$

$$861,84 = m_{L \rightarrow v} \cdot 335 \cdot 10^5$$

$$m_{L \rightarrow v} = \underline{\underline{2,57 \cdot 10^{-3} \text{ kg}}}$$

13.) $A = 1,6 \text{ m}^2$

$$d = 2,0 \text{ mm}$$

12. $T_1 = 36^\circ\text{C}$

$$T_2 = 110^\circ\text{C}$$

$$Q/t = ?$$

$$k_{\text{VUNA}} = 0,040 \text{ J/s} \cdot \text{m} \cdot \text{K}$$

$$Q = \frac{k \cdot A \cdot \Delta T \cdot t}{d}$$

$$Q/t = \frac{k \cdot A \cdot \Delta T}{d} = \frac{0,040 \cdot 1,6 \cdot 25}{2 \cdot 10^{-3}}$$

$$Q/t = \underline{\underline{8,0 \cdot 10^2 \text{ J/s}}}$$

14.) $T_1 = 21^\circ\text{C}$

$$T_2 = -78,5^\circ\text{C}$$

13. $Q = 0,350 \text{ m}$

$$d = 3,00 \text{ cm}$$

$$Q = 3,10 \text{ MJ}$$

$$k = ?$$

$$t = 1 \text{ dan} = 1 \cdot 24 \cdot 60 \cdot 60$$

$$= 86400 \text{ s}$$

$$A = a^2 = (0,350)^2$$

$$Q = \frac{k \cdot A \cdot \Delta T \cdot t}{d} \cdot 6 \Rightarrow$$

$$k = \frac{Q d}{6 A \cdot \Delta T \cdot t} =$$

$$= 1,47 \cdot 10^{-2} \text{ J/s} \cdot \text{m} \cdot \text{K}$$