8) $\Delta L = L_0 \cdot \alpha \cdot \Delta T$

$\Delta L = 33 \cdot 2{,}4 10^{-5} \cdot 15$

$\Delta L = 0{,}012\ m$

$\boxed{\Delta L = 1{,}2\ cm}$

$$V_0 = \frac{4}{3}\pi R^3$$

$$V_0 = \frac{4}{3}\pi (0,1)^3$$

$$V_0 = 4,2\,10^{-3}\ m$$

$$\Delta V = V_0 \cdot \gamma \cdot \Delta T$$

$$\Delta V = V_0 \cdot 3\alpha \cdot \Delta T$$

$$\Delta V = 4,2\,10^{-3} \cdot 3\,(2,4\,10^{-5}) \cdot$$

$$\boxed{\Delta V = 30,24\,10^{-6}\ m^3}$$

$$\boxed{\Delta V = 30,24\ cm^3}$$

10)

$L_0 = 10\,cm$ a $20°C$

$L = 10{,}015$ a $100°C$

a) $\Delta L = 0{,}015\,cm = 1{,}5 \cdot 10^{-2}\,cm$

$\Delta L = L_0 \cdot \alpha \cdot \Delta T$

$1{,}5 \cdot 10^{-2} = 10 \cdot \alpha \cdot 80$

$\alpha = \frac{1{,}5 \cdot 10^{-2}}{800}$

$\alpha = 1{,}87 \cdot 10^{-5}\,°C^{-1}$

$\Delta L = L_0 \cdot \alpha \cdot \Delta T$

$\Delta L = 10 \cdot 1{,}87 \cdot 10^{-5} \cdot (-20)$

$\Delta L = -3{,}74 \cdot 10^{-3}\,cm$

$\Delta L = L - L_0$

$-3{,}74 \cdot 10^{-3} = L - 10$

$L = 10 - 3{,}74 \cdot 10^{-3}$

$\boxed{L = 9{,}996\,cm}$

$\Delta L = L - L_0$

$\Delta L = 1{,}009 - 10$

$\Delta L = 0{,}009$

$\Delta L = 9 \cdot 10^{-3}$

$\Delta L = L_0 \cdot \alpha \cdot \Delta T$

$9 \cdot 10^{-3} = 10 \cdot 1{,}87 \cdot 10^{-5} \cdot \Delta T$

$$\Delta T = \frac{9 \cdot 10^{-3}}{1{,}87 \cdot 10^{-4}}$$

$\Delta T = 48$

$\Delta T = T$

$48{,}12 = T$

$\boxed{T = 68}$

$A = A_0 \cdot \beta$

$\Delta L = L - L_0$

$\Delta L = 1{,}009 - 10$

$\Delta L = 0{,}009$

$\Delta L = 9.10^{-3}$

$\Delta L = L_0 . \alpha . \Delta T$

$9.10^{-3} = 10 . 1{,}87.10^{-5} . \Delta T$

$\Delta T = \dfrac{9.10^{-3}}{1{,}87.10^{-4}}$

$\Delta T = 48{,}12°C$

$\Delta T = T - T_0$

$48{,}12 = T - 20$

$\boxed{T = 68{,}12°C}$

$A = A_0 . \beta . \Delta T$

$\Delta L = L - L_0$

$\Delta L = 1{,}009 - 1{,}0$

$\Delta L = 0{,}009$

$\Delta L = 9 \cdot 10^{-3}$

$\Delta L = L_0 \cdot \alpha \cdot \Delta T$

$9 \cdot 10^{-3} = 10 \cdot 1{,}87 \cdot 10^{-5} \cdot \Delta T$

$$\Delta T = \frac{9 \cdot 10^{-3}}{1{,}87 \cdot 10^{-4}}$$

$\Delta T = 48{,}12°C$

$\Delta T = T - T_0$

$48{,}12 = T - 20$

$\boxed{T = 68{,}12°C}$

$A = A_0 \cdot \beta \cdot \Delta T$

$\alpha = 1,8 \cdot 10^{-5} °C^{-1}$

11) $\phi_0 = 2,725\ cm$ a $0°C$

$\phi_1 = ?$ a $100°C$

$\Delta L = L_0 \cdot \alpha \cdot \Delta T$

$\Delta L = 2,725 \cdot 2,4 \cdot 10^{-5} \cdot 100$

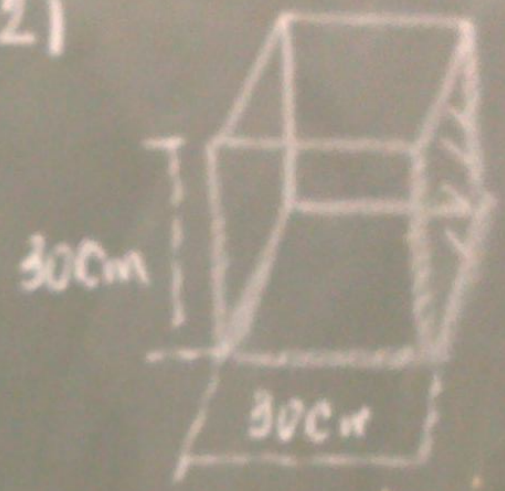
$\Delta L = 6,54 \cdot 10^{-3}\ cm$

$\Delta L = L - L_0$

$L = 6,4 \cdot 10^{-3} + 2,725$

$\boxed{L = 2,73\ cm}$

12)



$A_0 = 30 \times 30 = 900\ cm^2$

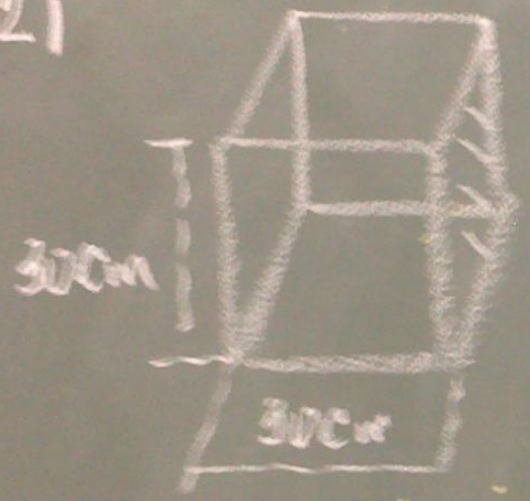
$\Delta A = A_0 \cdot \beta \cdot \Delta T$

$\Delta A = 900 \cdot 2 \cdot (1,8 \cdot 10^{-5}$

$\Delta A = 1,78\ cm^2$

$\alpha = 1{,}8 \cdot 10^{-5}\ °C^{-1}$

(12)



$A_0 = 30 \times 30 = 900\ Cm^2$

$\Delta A = A_0 \cdot \beta \cdot \Delta T$

$\Delta A = 900 \cdot 2 \cdot (1{,}8\ 10^{-5}) \cdot 55$

$\Delta A = 1{,}78\ Cm^2$

$\Delta A_T = 6 \times 1{,}78$

$\boxed{\Delta A_T = 10{,}68\ Cm^2}$