

$$\frac{E}{10} = \frac{2E+30}{30} \Rightarrow 3E = 2E+30 \Rightarrow E=30 \text{ OU } C=2E \Rightarrow C=2(30)=60^\circ\text{C}$$

3º) PELO GRÁFICO  $L_0=500\text{cm}$ ;  $\Delta L=0,1\text{cm}$ ;  $\Delta T=200^\circ\text{C}$ ;  $\Rightarrow \alpha) \Delta L=L_0 \cdot \alpha \cdot \Delta T \Rightarrow 0,1=500 \cdot \alpha \cdot (200)$

b)  $L_0=120\text{cm}$ ;  $\Delta T=(-80-10)=-90^\circ\text{C}$

$$\alpha = \frac{0,1}{(500)(200)} = 1,0 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\Delta L=L_f-L_0; \Delta L=L_0 \cdot \alpha \cdot \Delta T \Rightarrow L_f-L_0=L_0 \cdot \alpha \cdot \Delta T$$

$$L_f-120=120 \cdot (1,0 \times 10^{-6}) \cdot (-90) \Rightarrow L_f-120=-0,0108 \Rightarrow L_f=120-0,0108=119,98\text{cm}$$

3º)  $L_0=80\text{cm}$ ;  $\Delta L=0,8\text{mm}$  OU  $0,08\text{cm}$ ;  $\Delta T=50^\circ\text{C}$ ;  $\Delta L=L_0 \cdot \alpha \cdot \Delta T \Rightarrow 0,08=80 \cdot \alpha \cdot (50) \Rightarrow \alpha = \frac{0,08}{4000}$

$$\alpha = 2 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$$

4º) PARA MANTER SEMPRE NA HORIZONTAL AS VARIAÇÃO DAS COLUNAS TÊM QUE SER A MESMA. LOGO:  $\Delta L_{\text{CONC}} = \Delta L_{\text{FERRO}}$

$$\Delta L_{\text{CONC}} = L_c \cdot \alpha_c \cdot \Delta T; \Delta L_{\text{FER}} = L_f \cdot \alpha_f \cdot \Delta T$$

$$L_c = 7,8\text{m}; L_f = (7,8-h)$$

$$\alpha_c = 12 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}; \alpha_f = 13 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\Delta L_{\text{CONC}} = 7,8 \cdot (12 \times 10^{-6}) \Delta T; \Delta L_{\text{FER}} = (7,8-h) \cdot (13 \times 10^{-6}) \Delta T$$

COMO  $\Delta L_c = \Delta L_f$  TEMOS:

$$\Delta L_c = \Delta L_f \Rightarrow 7,8(12 \times 10^{-6}) \Delta T = (7,8-h)(13 \times 10^{-6}) \Delta T \Rightarrow 9,36 \times 10^{-5} = (7,8-h) \cdot 13 \times 10^{-6}$$

$$\Rightarrow \frac{9,36 \times 10^{-5}}{13 \times 10^{-6}} = (7,8-h) \Rightarrow 7,2 = (7,8-h) \Rightarrow h = 7,8 - 7,2 \Rightarrow h = 0,6\text{m}$$

5º)  $A_0=10\text{cm}^2$ ;  $T_0=20^\circ\text{C}$ ;  $\alpha_F=1,2 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$ ;  $T=270^\circ\text{C}$ ;  $\beta=2 \cdot \alpha_F \Rightarrow \beta=2,4 \times 10^{-5} \text{ } ^\circ\text{C}^{-1}$ ;  $\Delta A=A_0 \cdot \beta \cdot \Delta T$

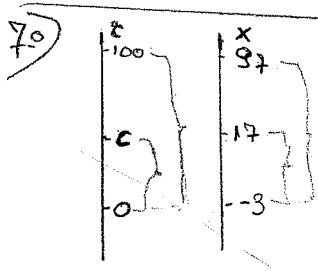
$$\Delta A=A-A_0; A-A_0=A_0 \cdot \beta \cdot \Delta T \Rightarrow A-10=10 \cdot (2,4 \times 10^{-5}) \cdot (270-20) \Rightarrow A-10=0,06 \Rightarrow A=10,06\text{cm}^2$$

6º) SE AUMENTOU  $2,1\text{cm}^3$ , ISSO É A VARIAÇÃO...  $\Delta V=2,1\text{cm}^3$ ;  $\Delta T=(75-25) \Rightarrow \Delta T=50^\circ\text{C}$

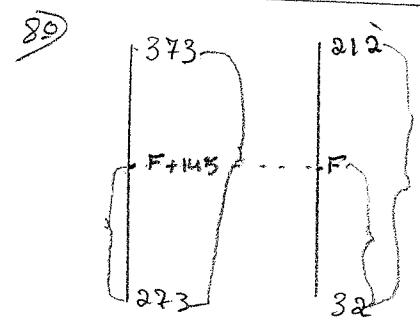
$$\alpha=14 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}; \gamma=3 \cdot \alpha \Rightarrow \gamma=3(14 \times 10^{-6})=42 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\Delta V=V_0 \cdot \beta \cdot \Delta T \Rightarrow 2,1=V_0 \cdot 42 \times 10^{-6} \cdot (50)$$

$$V_0 = \frac{2,1}{2,1 \times 10^{-3}} = 1000\text{cm}^3$$



$$\frac{C}{100} = \frac{17-(-3)}{97-(-3)} \Rightarrow \frac{C}{100} = \frac{20}{100} \Rightarrow C=20^\circ\text{C}$$



$$\frac{(F+145)-273}{373-273} = \frac{F-32}{212-32} \Rightarrow \frac{F-128}{100} = \frac{F-32}{180} \Rightarrow \frac{F-128}{5} = \frac{F-32}{9} \Rightarrow$$

$$\Rightarrow 9(F-128) = 5(F-32) \Rightarrow 9F-1152 = 5F-160 \Rightarrow 4F=992; F = \frac{992}{4} = 248^\circ\text{F}$$

OU

$$K = F + 145$$

$$K = 248 + 145$$

$$K = 393^\circ\text{K}$$

# SUCESSO A TODAS... E OBRIGADO.#