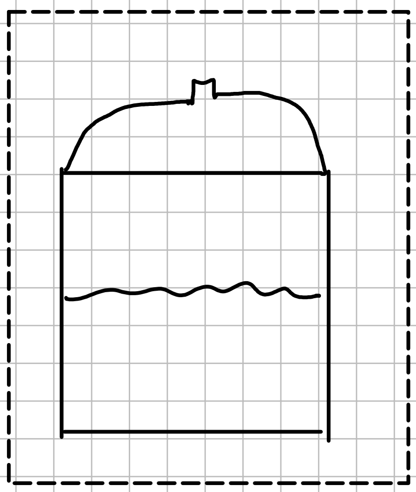
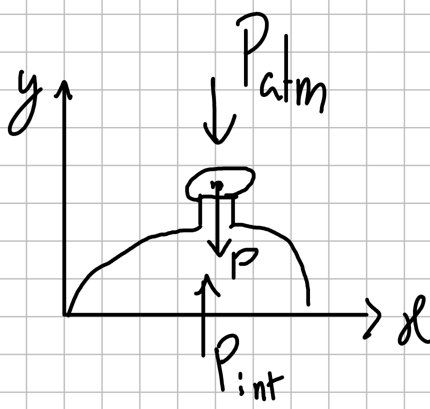
Lista 2

1)





Como se trata da pressão manométrica temos:

$$P_{int} = P_{atm} + 100\ KPa$$

$$P_{ress} = F/a \rightarrow \sum F = 0 \therefore$$

$$P + (P_{int} - P_{atm})A_v = 0 \therefore$$

$$mg + (\cancel{P_{atm}} + 100\ KPa - \cancel{P_{atm}})\ 4\times10^{-6} \therefore m_v g + 100\times10^{3}\times 4\times10^{-6} = 0$$

$$m_v = \frac{4\times10^{-1}}{9,81} = 4,08\times10^{-2}\ Kg = 40,8\ g$$

Alternativa D

Para $P_{int} = 0{,}201$ MPa da Tabela:

T (°C)	P (MPa)
120	0,19853
T	0,201
125	0,2321

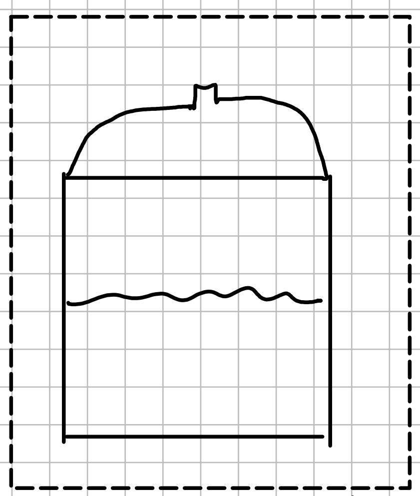
Aplicando interpolação

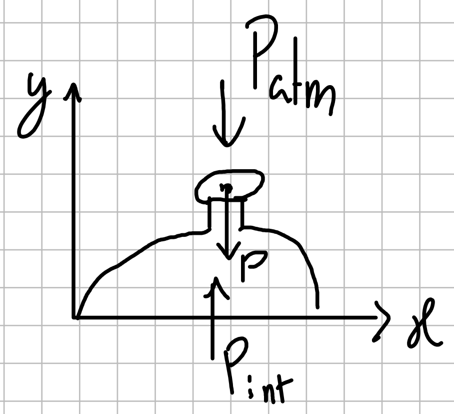
$$\frac{y_2 - y_0}{x_2 - x_0} = \frac{y_1 - y_0}{x_1 - x_0}$$

$$\frac{125 - 120}{0{,}2321 - 0{,}19853} = \frac{T - 100}{0{,}21 - 0{,}19853}$$

$$\therefore \boxed{T = 120{,}36\,°C}$$

2) De forma análoga ao exercício anterior, temos os seguintes diagramas:





Nesse estado, temos as seguintes propriedades:

$$\begin{cases} X = 0 \\ T_{eb} = 120\,°C \end{cases} \Rightarrow CAT3 \rightarrow P_{int} = 0{,}19853\,MPa$$

Seguindo o mesmo raciocínio:

$$\sum F = 0$$

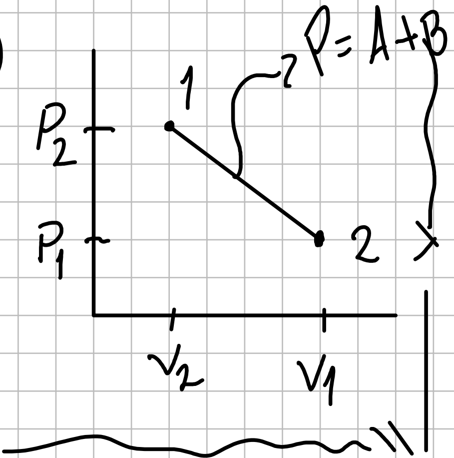
$$P_{atm} \cdot A + mg = P_{int} A \;\therefore$$

$$mg = (P_{int} - P_{atm}) A \;\therefore\; m = \frac{(P_{int} - P_{atm})A}{g}$$

$$m = \frac{(0{,}1985 - 0{,}1013) \times 10^6 \times 5 \times 10^{-6}}{9{,}81}$$

$$m = 0{,}0496 \text{ Kg} = \boxed{49{,}6 \text{ Kg}}$$

---

3) 

Basta resolver o sistema:

$P_1 = 0{,}1$ MPa ; $P_2 = 0{,}3$ MPa

$V_1 = 0{,}3\ m^3$; $V_2 = 0{,}1\ m^3$

$$\begin{cases} 0{,}1 \times 10^6 = A + 0{,}3\,B \\ 0{,}3 \times 10^6 = A + 0{,}1\,B \end{cases} \; (-)$$

$$-0{,}2 \times 10^6 \text{ Pa} = 0{,}2\,B \text{ m}^3$$

$$\rightarrow B = -\frac{0{,}2}{0{,}2} \times 10^6 \frac{\text{Pa}}{\text{m}^3} \;\therefore\; B = -10^6 \text{ Pa/m}^3$$

$$\rightarrow 0{,}1 \times 10^6 \text{ Pa} = A - 0{,}3 \times 10^6 \frac{\text{Pa}}{\cancel{\text{m}^3}} \cancel{\times \text{m}^3}$$

$$A = (0{,}1 + 0{,}3) \times 10^6 \text{ Pa} \;\therefore\; A = 0{,}4 \times 10^6 \text{ Pa}$$

$$\rightarrow P = 0{,}4 - V \text{ MPa}$$

Neste caso, o trabalho é dado por:

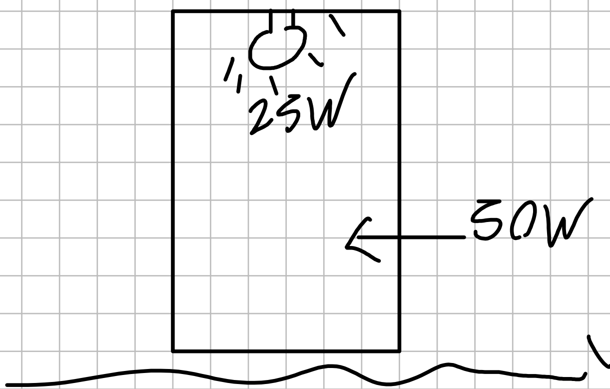
$$W = \int_1^2 P\,dV = \int_{V_1}^{V_2} 0{,}4 - V\,dV = 0{,}4V - \frac{V^2}{2}\Big|_{V_1}^{V_2} \;\therefore$$

$$W = 0{,}4(V_2 - V_1) - \frac{V_2^2 - V_1^2}{2} = -0{,}04 \text{ J}$$

4) Dados:

$A = 1\,m^2$; $h = 15\ W/m^2K$; $T_0 = 20°C$

Esquema:



Levando em consideração as duas fontes de calor

$Q_{vaz} = 50 + 25 = 75\ W$

De acordo com a lei de resfriamento de Newton:

$$Q = hA\Delta T \therefore \Delta T = \frac{Q}{hA} = \frac{75\,\cancel{W}}{15\,\frac{\cancel{W}}{\cancel{m^2}K} \times 1\,\cancel{m^2}} \therefore$$

$\Delta T = 5\,K$

Portanto:

$$\Delta T = T_f - T_0 \therefore T_f = T_0 + \Delta T = 25°C$$

---

5) Dados:

$m_r = 1\ Kg$; $T_1 = 110°C$; $P_1 = 600\ KPa$; $V_1 = V_2$;
$X_2 = 1$; $X_3 = 0$; $P_3 = P_2$

CAT3:

$v_1 = 0{,}04946\ m^3/Kg \rightsquigarrow V_1 = 0{,}04946\ m^3$

$V_3 = 0{,}00753$

Tabela B:

$P_2 = 416\ KPa$

Esquema:

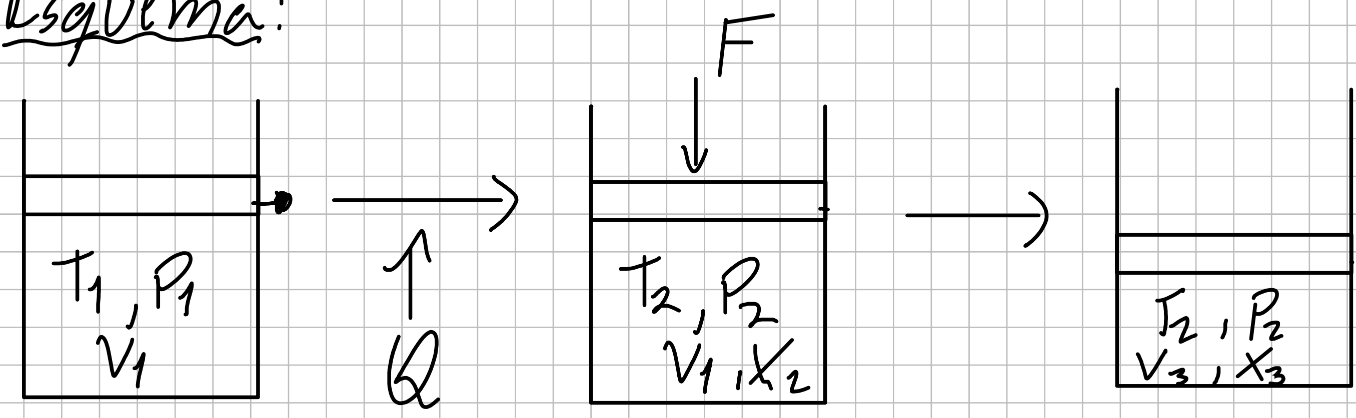
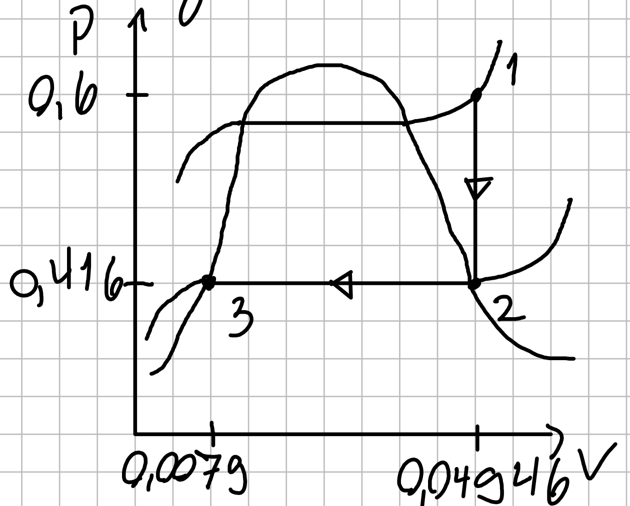


Diagrama P x V



De 1 p/2 não há variação de Volume, portanto:

$$_1W_2 = \int_1^2 P\,dV = 0$$

No trajeto de 2 p/3 temos:

$$_2W_3 = \int_2^3 P\,dV = P\int_2^3 dV = P \times (V_3 - V_2) \therefore$$

$$_2W_3 = 416 \times (0{,}0079 - 0{,}04946) \therefore$$

$$_2W_3 \simeq -17{,}27 \text{ KJ}$$