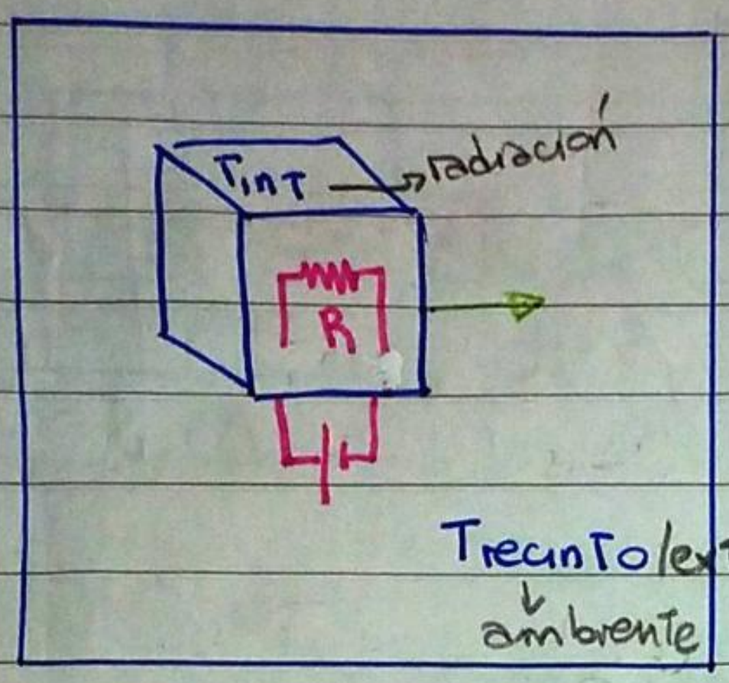
1)



DATO Melina Sol

$l = 0{,}8\ m$ Fleitas

$T_{INT} = 181°C = 454\ K$

$T_{RECINTO} = 23°C = 296\ K$

$h_{CV} = 14\ W/m^2K$

$\sigma = 5{,}67 \times 10^{-8}\ \frac{W}{m^2 K^4}$

$e = 3{,}1$

$= l.l$

$6 = 6.l.l =$ 

Potencia (Flujo calorífico)

$H = H_{radiación} + H_{convección}$

$H = \sigma e A (T^4 - T_0^4) + (-h).A(T - T_0)$

$H = \sigma e A (T_{radiación}^4 - T_{ambRECINTO}^4) - h_{cv} A (T_{EXT} - T_{INT})$

$H = 5{,}67 \times 10^{-8} \frac{W}{m^2 K^4} . 3{,}1 . 6.0{,}8^2 m^2 . (454^4 - 296^4) K^4 - 14 \frac{W}{m^2 K} . 6.0{,}8^2 m^2 (296 - 454) K$

$H = 23493{,}38468\ W + 8494{,}08\ W$

$H = 31987{,}46468\ W$

NOTA = en el ejercicio $e = 3{,}1$, lo cual no es posible, ya que el valor maximo de la emisividad es 1.
Como el sistema sólo carga los valores en la fórmula, realice el reemplazo con el "e = 3,1" que indico la consigna.

=> Si considero que $\varepsilon = 0{,}31$ (valor aceptable → $0{,}31 < 1$.)

$H = 5{,}67 \times 10^{-8} . 0{,}31 . 6 . 0{,}8^2 . (454^4 - 296^4) - 14 . 6 . 0{,}8^2 (296 - 454)$

$H = 12349{,}38468 \left[\frac{W}{m^2 K^4} m^2 . K^4\right] + \left[\frac{W}{m^2 K} m^2 K\right] 8494{,}08$

$H = 10843{,}41847\ W$ Valor de la potencia calorífica con $e = 0{,}31$

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21

	Interior	¿To?	Exterior
HORNO	$T_{INT} = 680°C$ $K_{INT} = 0{,}004 \frac{cal}{s.cm°C}$ $\Delta x = 20\,cm$		$T_{INT} = 31°C$ $K_{EXT} = 0{,}0002 \frac{cal}{s\,cm°C}$ $\Delta x = 11\,cm$

ø inicio ——————————→ Final

- Flujo calorífico

$$H = -K \frac{A \Delta T}{\Delta x}$$

$$R = \frac{\Delta x}{AK}$$

$$H = \frac{-\Delta T}{\left(\frac{\Delta x}{KA}\right)}$$

$$H = -\frac{\Delta T}{R_{TH}}$$

$$H = -\frac{(T - T_o)}{R_{TH}}$$

$$H = \frac{T_o - T}{R_{TH\,eq}}$$

$$H = \frac{(680 - 31)°C}{\frac{60000}{A} \frac{cm^2\,°C\,seg}{cal}}$$

$$\frac{H}{A} = \frac{649}{60000} \frac{cal}{cm^2\,seg}$$

$$\frac{H}{A} \cong 0{,}0108 \frac{cal}{cm^2\,seg}$$

- Las Paredes están en serie: ΣR_{TH}

$$R_{TH\,eq} = R_{TH\,INT} + R_{TH\,EXT}$$

$$R_{TH\,eq} = \frac{\Delta x_{INT}}{A\,K_{INT}} + \frac{\Delta x_{EXT}}{A\,K_{EXT}}$$

$$R_{TH\,eq} = \frac{1}{A}\left(\frac{\Delta x_{INT}}{K_{INT}} + \frac{\Delta x_{EXT}}{K_{EXT}}\right)$$

$$R_{TH\,eq} = \frac{1}{A}\left(\frac{20}{0{,}004} + \frac{11}{0{,}0002}\right) \frac{cm}{cal} \frac{cm°C.1}{}$$

$$R_{TH\,eq} = \frac{60\,000}{A} \frac{cm^2 \cdot °C\,seg}{cal}$$

$H = H_{INT} = H_{EXT}$ (por disposición en serie)

$$H_{INT} = -\frac{\Delta T}{R_{INT}}$$

$$H_{INT} = -(T_F - T_o) / R_{INT}$$

$$H_{INT} = (T_o - T_F) / R_{INT}$$

$$H_{INT} = (T_{INT} - T_U) / R_{INT}$$

$$H_{INT} = \frac{(T_{INT} - T_U)}{\frac{\Delta x_{INT}}{K_{INT}} \frac{1}{A}}$$

$$\frac{H}{A} = \frac{H_{INT}}{A} = \frac{(680 - T_U)}{\left(\frac{20}{0{,}004}\right)}$$

Asamblea

$$\frac{H}{A} = \frac{H_{inT}}{A}$$

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$$\frac{649}{60000}\ \frac{cal}{cm^2 seg} = \frac{680 - T_U}{5000}\ \frac{cm^2 \cdot ^\circ C\ seg}{cal}$$

$$\left(\frac{649}{60.000} \cdot 5000\right) \frac{cal}{cm^2 seg} \cdot \frac{cm^2 \cdot ^\circ C\ seg}{cal} - 680 = -T_U$$

$$+625,9167\ ^\circ C = +T_U$$

$$6,25,9167\ ^\circ C = T_U$$

3) reducir 56% la Potencia (Flujo calorífico)

$K_{aislante} = 0,01\ W/m\,^\circ C$

$K_{pared} = 5 \times 10^{-4}\ cal/s.cm\,^\circ C$

espesor aislante = $\Delta x_{aislante}$ = ??

espesor sin aislante = $\Delta x_{pared} = 0,51\ m$

- inicialmente: Pared
- final = Pared + aislante (en serie)

$$H_{final} = H_{inicial} \cdot (1 - 0,56)$$

$$H_{final} = H_{inicial}\ 0,44$$

$$-\frac{K.A\ \Delta T_F}{\Delta x_F} = \frac{-K\,A\,\Delta T_o}{\Delta x_o}\ 0,44$$

$$-\frac{\Delta T_F}{\left(\frac{\Delta x_F}{K\,A}\right)} = -\frac{\Delta T_o}{\left(\frac{\Delta x_o}{KA}\right)}\ 0,44 \qquad R_{TH} = \frac{\Delta x}{KA}$$

$$+\frac{\Delta T_F}{R_{TH_F}} = +\frac{\Delta T_o}{R_{TH_o}} \cdot 0,44$$

$$\frac{1}{R_{TH_F}} = \frac{1}{R_{TH_o}} \cdot 0,44$$

$$R_{TH_o} = R_{TH_F} \cdot 0,44$$

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$R_{TH\ PARED} = (R_{TH\ pared} + R_{TH\ aislante})\ 0,44$

$R_{TH\ pared} - 0,44\ R_{TH\ pared} = R_{TH\ aislante}\ 0,44$

$R_{TH\ pared} \cdot \frac{(1-0,44)}{0,44} = R_{TH\ aislante}$

$\frac{\Delta x\ pared}{A \cdot K\ pared} \cdot \frac{14}{11} = \frac{\Delta x\ aislante}{A \cdot K\ aislante}$

$\frac{\Delta x\ pared}{11} \cdot \frac{14}{K\ pared} \cdot \frac{K\ aislante}{K\ pared} = \Delta x\ aislante$

$Q\ S\ 1 \cdot \frac{14}{11} \cdot \frac{0,01}{0,2093} = \Delta x\ aislante$

$0,03\ l\ m = \Delta x\ aislante$

C.A

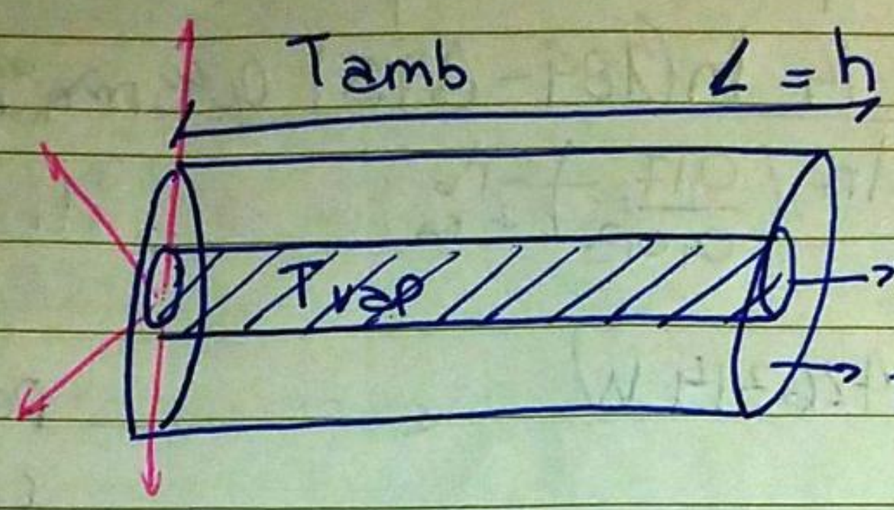
$\frac{1\ cal}{1 \cdot cm \cdot °C} \cdot \frac{100\ cm}{1\ m} \cdot \frac{4,186\ J}{1\ cal}$

$\rightarrow 418,6\ \frac{J}{seg \cdot m \cdot °C} = 418,6\ \frac{W}{m \cdot °C}$

$\Rightarrow 5 \times 10^{-4} \cdot 418,6 = 0,2093\ \frac{W}{m \cdot °C}$

↑ K pared

4)



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geometría cilíndrica

$\emptyset_{tubería} = 0{,}260\,m \rightarrow r_A = 0{,}13\,m$

$T_{vap} = 375°C = 648\,K$

esp. aislante $= 0{,}04\,m \rightarrow esp + r_A = r_B = 0{,}17\,m$

$K_{FV} = 0{,}048\ W/mK$

$L = 14\,m = h$

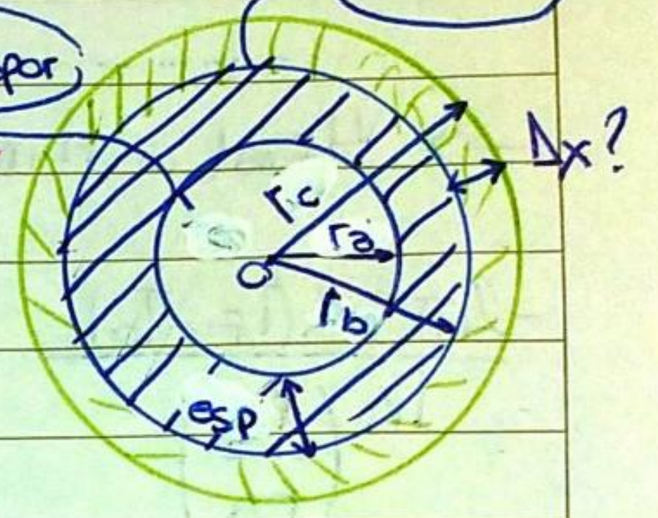
$T_{amb} = 16°C = 289\,K$

reducir 32% la perdida de energia calorica ¿ Δx aislante?

Final

$T_B = T_{amb}$

$T_A = T_{vapor}$ INICIAL



$(\Delta x = r_c - r_b)$

nuevo — original

$$H = -K A \cdot \frac{dT}{dr}$$

$$H = -K (2\pi r h) \cdot \frac{dT}{dr}$$

$$\int_{r_a}^{r_b} H \cdot \frac{dr}{r} = \int_{T_a}^{T_B} -2\pi h\, dt$$

$$H \int_{r_a}^{r_b} \frac{dr}{r} = -2\pi h K \int_{T_a}^{T_b} dt$$

$$H \ln r \Big|_{r_a}^{r_b} = -K 2\pi h T \Big|_{T_a}^{T_b}$$

$$H (\ln r_b - \ln r_a) = -2\pi h K (T_b - T_a)$$

$$H \cdot \ln\left(\frac{r_b}{r_a}\right) = -K 2\pi h (T_b - T_a)$$

$$\boxed{H = \frac{-2\pi h K (T_b - T_a)}{\ln (r_b / r_a)}}$$

Asamblea

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$$\Rightarrow H_{inicial} = -\frac{2\pi\, 14\, (289-648)\, 0{,}048\ m\,K\,\frac{W}{m\,K}}{\ln\left(\frac{0{,}17}{0{,}13}\right)}$$

(h, $T_b = T_{amb}$, $r_a = T_{vap}$, r_b)

$H_{inicial} = 5650{,}426314\ W$ ← Perdida de calor (100%)

$\Rightarrow H_{final} = H_{inicial}\,(1-0{,}32)$

inicial → ya calculada con r_a y r_b

final → calcularla con r_a y r_c

$$-\frac{2\pi\, hK(T_F-T_0)}{\ln\left(\frac{r_c}{r_a}\right)} = H_{inicial}\cdot 0{,}68$$

$$-\frac{2\pi\, 14\cdot 0{,}048\,(289-648)}{\ln\left(\frac{r_c}{0{,}13}\right)} = 5650{,}426314\cdot 0{,}68$$

$$\frac{1515{,}805889}{\ln\left(\frac{r_c}{0{,}13}\right)} = 3842{,}289894$$

$$\frac{1515{,}805889}{3842{,}289894} = \ln\left(\frac{r_c}{0{,}13}\right)$$

Def. de log: $\ln_e x = c \leftrightarrow e^c = x$

$$e^{0{,}394505\,8626} = \frac{r_c}{0{,}13}$$

$$0{,}13\cdot(1{,}4836508882) = r_c$$

$$0{,}19287\,m = r_c$$

$\Rightarrow \Delta x = r_c - r_b$

$\Delta x = 0{,}19287 - 0{,}17$

$\Delta x = 0{,}02287\ m$

Calorimetro ideal

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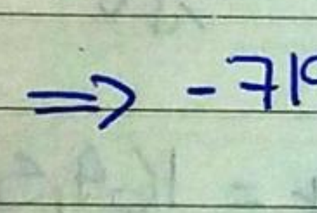
5) $m_{Hielo} = 60,5\ g$ $T_{Hielo} = -23,8°C$ $C_{Hielo} = 0,5\ cal/g°C$

$m_{Agua} = 329\ g$ $T_{agua} = 17,4°C$ $L_F = 80\ cal/g$

$mv?$ $Tv = 100°C$ $Lv = 540\ cal/g$

Estado final → $T_{eq} = 100°C$, Liquido

ETAPA A



- $Q_{Hielo\ a\ 0°C} = m_{Hielo} \cdot C_{Hielo}\ (T_F - T_0)$

$Q_{Hielo\ a\ 0°C} = 60,5\ g \cdot 0,5\ \frac{cal}{g°C}\ (0° - (-23,8))°C$

$\boxed{Q_{Hielo\ a\ 0°C} = 719,95\ cal}$

- $Q_{Agua\ a\ 0°C} = m_{Agua} \cdot C_{agua}\ (T_F - T_0)$

$Q_{agua\ a\ 0°C} = 329\ g\ 1\ \frac{cal}{g°C}\ (0 - 17,4)°C$

$Q_{agua\ a\ 0°C} = -5724,6\ cal$ (X)

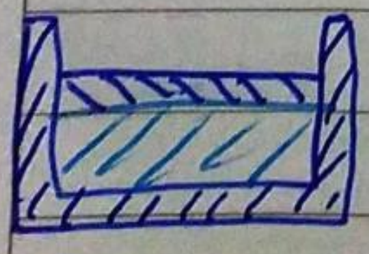
$\Rightarrow -719,95\ cal = 329\ g \cdot 1\ \frac{cal}{g°C} \cdot (T_F - 17,4)$

$\frac{-719,95\ cal - 329 \cdot (-17,4)\ cal}{329\ \frac{cal}{°C}} = T_F$

$\boxed{15,21°C = T_F}$

ETAPA A → Hielo a 0°C en su totalidad + agua a 15,21°C

ETAPA B



- $Q_F = m_{Hielo} \cdot L_F$

$Q_F = 60,5\ g\ 80\ \frac{cal}{g}$

$\boxed{Q_F = 4840\ cal}$

- $Q_{agua\ a\ 0°C} = m_{agua} \cdot C_{agua}\ (0° - 15,21)$

$Q_{agua\ a\ 0°C} = 329\ g\ \frac{1\ cal}{g°C}\ (-15,21)°C = -5004,09\ cal$ (X)

Asamblea

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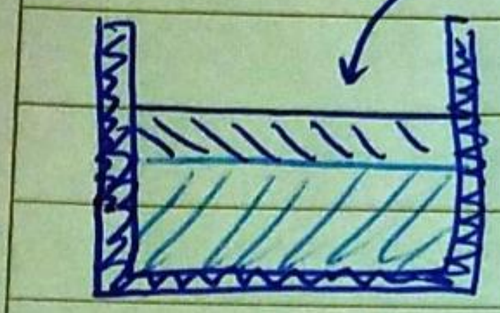
$$\Rightarrow -4840\ cal = 329\ g \cdot \frac{1\ cal}{g \cdot °C} (T_F - 15{,}21)$$

$$\frac{-4840\ cal - 329 \cdot (-15{,}21)\ \frac{cal \cdot °C}{°C}}{329\ \frac{cal}{°C}} = T_F$$

$$0{,}5\ °C = T_F$$

ETAPA B → agua a 0° (antes hielo) y agua a 0,5°C

ETAPA C



$Q_{agua\ total\ a\ 100°C} = m_{T\ agua} \cdot C_{agua} (100 - T_{eq})$

$Q_{agua\ total} = (60{,}5 + 329) \cdot 1 \cdot (100 - 0{,}42)$

$Q_{agua\ total} = 38786{,}41\ cal$

$Q_V = m_V \cdot L_V$

$Q_V = m_V \cdot 540\ \frac{cal}{g}$

¿Tequilibrio?

$Q_{agua_0} + Q_{agua} = 0$

$60{,}5\ g \cdot \frac{1\ cal}{°C\ g} \cdot (T_{eq} - 0) + 329\ g \cdot \frac{1\ cal}{g \cdot °C} (T_{eq} - 0{,}5) = 0$

$60{,}5\ T_{eq} + 329\ T_{eq} = 164{,}5$

$T_{eq} = \frac{164{,}5\ cal}{389{,}5\ \frac{cal}{°C}}$

$T_{eq} = 0{,}42\ °C$

$\Rightarrow Q_{agua\ total} = Q_V$

$38786{,}41\ cal = m_V \cdot 540\ \frac{cal}{g}$

$\frac{38786{,}41\ cal}{540\ \frac{cal}{g}} = m_V$

$71{,}8267\ g = m_V$

samblea