

DATOS

$$D = 3 \text{ [m]}$$

$$e = 0,01 \text{ [m]}$$

$$r_1 = \frac{D}{2}$$

$$r_2 = r_1 + e$$

$$A_1 = 4 \cdot \pi \cdot r_1^2$$

$$A_2 = 4 \cdot \pi \cdot r_2^2$$

$$T_{s1} = 0 \text{ [C]}$$

$$T_{\text{air}} = 25 \text{ [C]}$$

$$T_{\text{surr}} = 20 \text{ [C]}$$

$$\varepsilon = 0,94 \text{ [-]}$$

$$k = 0,25 \text{ [W/m}\cdot\text{C]}$$

$$h = 30 \text{ [W/m}^2\cdot\text{C]}$$

$$\sigma = 5,67 \cdot 10^{-8} \text{ [W/m}^2\cdot\text{K}^4]$$

$$\rho_{\text{hielo}} = 916,8 \text{ [kg/m}^3]$$

$$h_{\text{if}} = 333,7 \cdot 1000 \text{ [J/kg]}$$

$$(\text{grad}) = C_1 / r^2$$

$$C_1 = 3496 \text{ [C/m]}$$

Preguntas 1 y 2

$$Q_{\text{cond}} = Q_{\text{rad}} + Q_{\text{conv}}$$

$$Q_{\text{cond}} = -k \cdot A_2 \cdot \text{grad}$$

$$\text{grad} = \frac{C_1}{r_2^2}$$

$$Q_{\text{rad}} = \varepsilon \cdot A_2 \cdot \sigma \cdot ((T_{s2} + 273)^4 - (T_{\text{surr}} + 273)^4)$$

$$Q_{\text{conv}} = h \cdot A_2 \cdot (T_{s2} - T_{\text{air}})$$

Pregunta 3

$$Q_{\text{cond}} = -\dot{m} \cdot h_{\text{if}}$$

$$m_{\text{hielo}} = \rho_{\text{hielo}} \cdot V$$

$$V = 4/3 \cdot \pi \cdot r_1^3$$

$$t = \frac{m_{\text{hielo}}}{\dot{m} \cdot 3600}$$

SOLUTION

Unit Settings: SI C kPa J mass deg

$A_1 = 28,27 \text{ [m}^2\text{]}$

$A_2 = 28,65 \text{ [m}^2\text{]}$

$C_1 = 3496 \text{ [C/m]}$

$D = 3 \text{ [m]}$

$e = 0,01 \text{ [m]}$

$\varepsilon = 0,94 \text{ [-]}$

$\text{grad} = 1533 \text{ [C/m]}$

$h = 30 \text{ [W/m}^2\text{·C]}$

$h_{if} = 333700 \text{ [kJ/kg]}$

$k = 0,25 \text{ [W/m·C]}$

$\dot{m} = 0,03291 \text{ [kg/s]}$

$m_{\text{hielo}} = 12961 \text{ [kg]}$

$Q_{\text{cond}} = -10983 \text{ [W]}$

$Q_{\text{conv}} = -9998 \text{ [W]}$

$Q_{\text{rad}} = -984,9 \text{ [W]}$

$\rho_{\text{hielo}} = 916,8 \text{ [kg/m}^3\text{]}$

$r_1 = 1,5 \text{ [m]}$

$r_2 = 1,51 \text{ [m]}$

$\sigma = 5,670\text{E-}08 \text{ [W/m}^2\text{·K}^4\text{]}$

$t = 109,4 \text{ [h]}$

$T_{\text{air}} = 25 \text{ [C]}$

$T_{s1} = 0 \text{ [C]}$

$T_{s2} = 13,37 \text{ [C]}$

$T_{\text{surr}} = 20 \text{ [C]}$

$V = 14,14 \text{ [m}^3\text{]}$