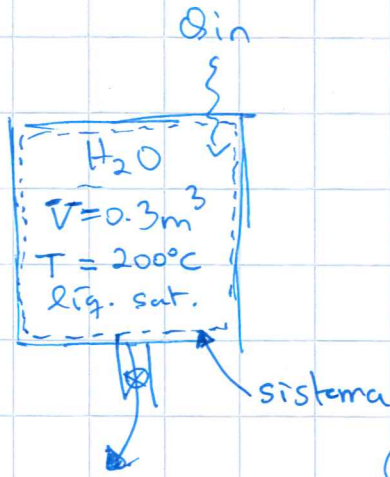


I2, Problema 1



(a) De la tabla A-4, vemos que

$$v_1 = v_f @ 200^\circ\text{C} = 0.001157 \text{ m}^3/\text{kg} \quad (0.5)$$

$$\text{Por ende } m_1 = \frac{V}{v_1} = 259.4 \text{ kg} \quad (0.5)$$

Conservación de masa: $\cancel{m_{entra}^0} - m_{sale} = m_2 - m_1$

y el enunciado dice que $m_{sale} = \frac{m_1}{2}$

$$\text{Por ende: } m_2 = \frac{m_1}{2} = 129.7 \text{ kg} \quad (0.5) \quad (\text{y } m_{sale} = m_2 = 129.7 \text{ kg})$$

$$(b) \quad v_2 = \frac{V}{m_2} \Rightarrow v_2 = \frac{0.3 \text{ m}^3}{129.7 \text{ kg}} = 0.002313 \text{ m}^3/\text{kg}$$

En la tabla A-4 vemos que $\left. \begin{array}{l} v_f @ 200^\circ\text{C} = 0.001157 \text{ m}^3/\text{kg} \\ v_g @ 200^\circ\text{C} = 0.12721 \text{ m}^3/\text{kg} \end{array} \right\} \quad (0.5)$

Puesto que $v_f @ 200^\circ\text{C} < v_2 < v_g @ 200^\circ\text{C}$
 \rightarrow mezcla saturada! 0.5

$$\text{Tenemos que } v_2 = v_f + x v_{fg} \Rightarrow x = \frac{v_2 - v_f}{v_{fg}}$$

$$\text{por lo que } x = \frac{0.002313 - 0.001157}{0.12721 - 0.001157} = 0.009171 \quad (1)$$

(c) Balance de energía: $\Delta E = E_2 - E_1 = \cancel{Q_{neto}^0} - \cancel{W_{neto}^0} + \underbrace{\sum \cancel{m_{entra}^0}}_{= U_2 - U_1} - \underbrace{\sum m_{sale}^0}_{= m_{sale} h_{sale}}$
 (ignoramos cambios en energía cinética y potencial) (ignoramos energía cinética y potencial)

$$\text{Nos queda } U_2 - U_1 = Q_{neto} - m_{sale} h_{sale}$$

$$m_2 u_2 - m_1 u_1 = Q_{neto} - m_{sale} h_{sale} \quad (1.25)$$

$$\text{De la tabla A-4 vemos que } h_{sale} = h_g @ 200^\circ\text{C} = 852.26 \text{ kJ/kg} \quad (0.25)$$

$$\text{y } u_2 = u_g @ 200^\circ\text{C} + x u_{fg} @ 200^\circ\text{C} = 850.46 + 0.009171(1743.7) = 866.45 \text{ kJ/kg} \quad (0.25)$$

y $u_1 = u_g @ 200^\circ\text{C} = 850.46 \text{ kJ/kg}$ 0.25

Luego, $\dot{Q}_{\text{neto}} = m_2 u_2 - m_1 u_1 + m_{\text{sale}} h_{\text{sale}}$

$$= (129.7)(866.45) - 259.4(850.46) + 129.7(852.26)$$
$$= 2307.4 \text{ kJ} \quad \text{0.5}$$

Note que $\dot{Q}_{\text{neto}} > 0$ como esperado, ya que es calor que entra al sistema