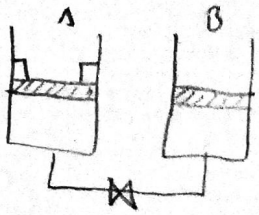
1er Parcial

Ceballos Burgos
Carlos Eduardo

(4)



Agua

$V_1^A = 0.04\ [m^3]$ | $m_B = 5\ [kg]$ | $P_2 = 1400°C$

$x_1^A = 0.2$ | $P_1^B = 2500\ [kPa]$

$P_1^A = 1000\ [kPa]$ | $T_1^B = 1000°C$

$P_e = 800\ [kPa]$

Estado 1

(A) $P\{1000\ [kPa]\} \rightsquigarrow \begin{cases} T_e = 179.91 \\ v_f = 0.001127 & u_f = 761.67 \\ v_g = 0.19444 & u_g = 2583.64 \end{cases}$

$v_1^A = 0.001127 + (0.2\,(0.19444 - 0.001127))$

$v_1^A = 0.0397896\ [m^3/kg]$, $\quad u_1^A = 1726.064\ [kJ/kg]$

$v = \frac{V}{m} \quad m = \frac{V}{v} = \frac{0.04}{0.039} = 1.00529\ [kg]_B$

(B) $P(2500\ [kPa]) \rightsquigarrow \{ T_e = 223.99°C$

$x_1^B < 0 \quad T(100°C) \rightsquigarrow \begin{cases} v_f = 0.001044 \\ u_f = 418.91 \end{cases}$

$v = \frac{V}{m} \quad V = mv$

$= 5\,(0.001044)$

$V = 5.22 \times 10^{-3}\ [m^3]$

$m_T = m_A + m_B = 1.00529 + 5 = 6.0053\ [kg]$

Estado 2

$T(400°C) \quad x_2 > 1$

$P(2500\ [kPa]) \rightsquigarrow T_{eB} = 223.99°C$

$v = \frac{V}{m} \rightsquigarrow V = mv$

$V = 6.0053\,(0.12016)$

$V = 0.72123\ [m^3]$.

$P(2500), T(400) \rightsquigarrow \begin{cases} v = 0.12016 \\ u = 2939.03 \end{cases}$

$V_2 = V_2^A + V_2^B$

$V_2^B = V_2 - V_2^A = 0.72123 - 0.04 = 0.6812\ [m^3]_e$

Trabajo

$$ {}_1W_2 = {}_1W_2^{A} + {}_1W_2^{B} = \int_1^2 {}_1P_2^{B}\, dv^{B} = {}_1P_2^{B}\left(V_2^{B} - V_1^{B}\right) $$

$$ {}_1W_2 = 2500\,(0.6812 - 0.00522) $$

$$ {}_1W_2 = 1690.0377\ [kJ]_F $$

Calor:

$$ Q = mu_2 - m^{A}u_1^{A} - m^{B}u_1^{B} + W $$

$$ Q = 6.0053\,(2939.03) - 1.0053\,(1126.064) - 5\,(418.91) + 1690.0377 $$

$$ \boxed{Q = 16773.2121\ [kJ]} $$