FI-10 GABARITO "P2-like" 22/05/2013

1 $T_1 = 273{,}15 - 123{,}15 = 150\ K$

$e = 99$ $\quad A = 18\ g/mol\ (H_2O)$

(a) $10\ mols \quad M = 180\ g$

$Q = ML_S = 180 \times 2700 = 486\ kJ$

$T = 3600\ s \qquad H_c = \frac{Q}{T} = \frac{486}{3{,}6} = 135\ W$

(b) $A_S = \pi R^2 = 3{,}14 \times (0{,}253)^2 = 0{,}20\ m^2$

$H_a = e\, I_S\, A_S = 0{,}9 \times 1400 \times 0{,}2 = 252\ W$

(c) $H_e = e\, 4\pi R^2 \sigma T_2^4 = 4 e A_S \sigma T_2^4$

$H_e = H_a - H_c = 252 - 135 = 117\ W$

$T_2^4 = \frac{H_a - H_c}{4 e A_S \sigma} = \frac{117 \times 10^8}{4 \times 99 \times 0{,}2 \times 5{,}67} = 2866 \times 10^8$

$T_2 = 231{,}4\ K \qquad \Delta T = 231{,}4 - 150 = 81{,}4\ K$

(d) $H_c = k \frac{A_T}{L} \Delta T = 135\ W$

$A_T = \frac{135 \times 100}{400 \times 81{,}4} = 0{,}41\ m^2$

(e) $\frac{1}{2} m \langle v^2 \rangle = \frac{3}{2} k T_1 = \frac{3}{2} \frac{R}{N_A} T_1$

$\langle v^2 \rangle = \frac{3 R T_1}{m N_A} = \frac{3 \times 8{,}31 \times 150}{9018} = 20{,}8 \times 10^4$

$v_{qm} = \sqrt{\langle v^2 \rangle} = 4{,}56 \times 10^2 = 456\ m/s$