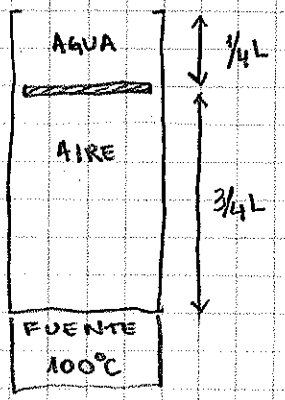
EXAMEN FÍSICA 2 18/12/2015

PROBLEMA 1.



AIRE: $C_v = 5/2\,R$ $\quad C_p = 7/2\,R$

$T_1 = 15°C = 288K$ $\quad T_F = 100°C = 373K$

$L = 2{,}0\,m$ $\quad A = 1{,}0\,m^2 \rightarrow V_1 = \frac{3}{4} \times 2 = 1{,}5\,m^3$

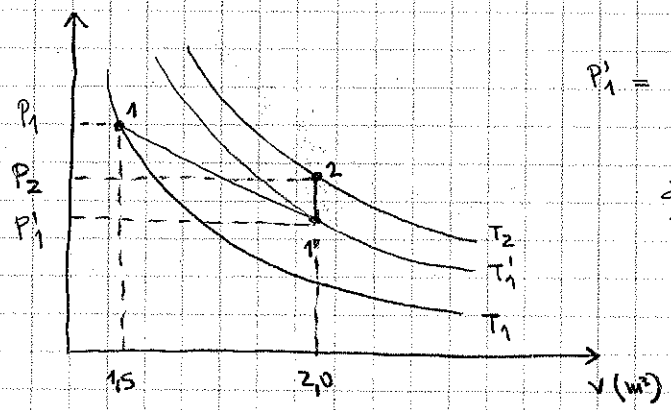
$P_1 = P_0 + \frac{m_{H_2O}\,g}{A} = P_0 + \rho \frac{L A g}{4A} = 106{,}225\,kPa$

$P_1 V_1 = nRT_1 \rightarrow nR = 0{,}5533$

a) $T_2 = T_F = 373K \rightarrow P_2 = \frac{nRT_2}{V_2} = 103{,}182\,kPa > P_0$. Llega a topes.

$V_2 = 2{,}0\,m^3$

b)



$P'_1 = 101{,}325\,kPa$ $\quad T'_1 = \frac{P'_1 V_2}{nR} = 366K$

c) $W = -\frac{(P_1 + P'_1)}{2}\Delta V = -52\,kJ$

$\Delta U = \frac{5}{2} nR\,(T_2 - T_1) = 117{,}6\,kJ$

$Q = \Delta U - W = 169{,}6\,kJ$

d) $\Delta S_T = -\frac{|Q_F|}{T_F} + \frac{5}{2} nR \ln\left(\frac{T_2}{T_1}\right) + nR \ln\left(\frac{V_2}{V_1}\right) = -0{,}455 + 0{,}358 + 0{,}159$

$\Delta S_T = 0{,}062\ kJ/K$

Nota: El agua desmasada también genera entropía

PROBLEMA 2

a) $x(t) = A \operatorname{sen} \omega t \quad / \quad \omega = 2\pi f = 25\ rad/s$.

$\dot{x}(t) = \omega A \cos \omega t \rightarrow \dot{x}_{máx} = \omega A = v_F$

$$\frac{f_o(mín)}{f_F} = \frac{1}{1 + v_F/v_s} = \frac{599}{600}$$

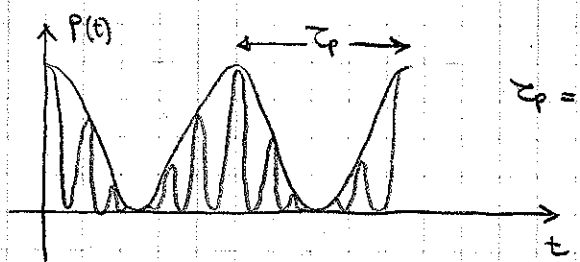
$$\frac{f_o(máx)}{f_F} = \frac{1}{1 - v_F/v_s} = \frac{601}{600}$$

$$\frac{1 - v_F/v_s}{1 + v_F/v_s} = \frac{599}{601} \rightarrow v_F = 0{,}57\ m/s$$

$A = 0{,}023\ m$

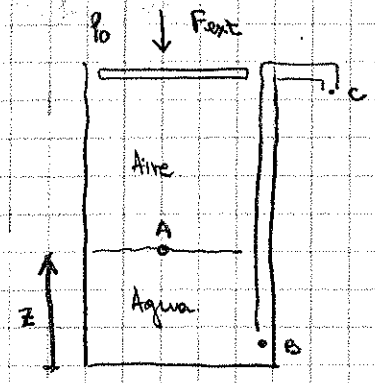
b) $f_{PULSADO} = f_a - f_b = 1\,Hz$

c)



$\tau_p = \frac{1}{f_{PULSADO}}$

PROBLEMA 3.



a) $P_A + \rho g z + \rho \frac{v_A^2}{2} = P_0 + \rho g H + \rho \frac{v_c^2}{2}$

$A v_A = a v_c \qquad A = 10\ cm^2 \ ; \ a = 0{,}5\ cm^2 \qquad v_A \ll v_c$

$\dot{V} = a v_c = 1 \times 10^{-4}\ m^3/s \rightarrow v_c = \frac{1 \times 10^{-4}}{0{,}5 \times 10^{-4}} = 2{,}0\ m/s$

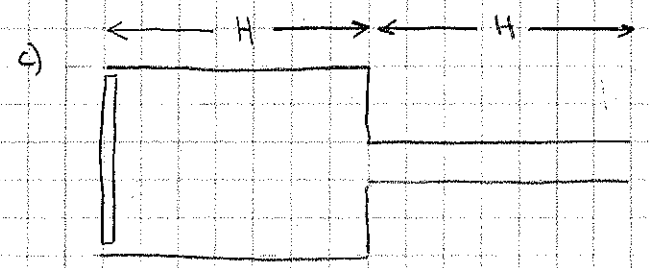
$P_A = P_0 + F_{ext}/A = P_0 + \rho g (H - z) + \rho \frac{v_c^2}{2}$

$F_{ext} = A \left[\rho g (H - z) + \rho v_c^2/2 \right]$

b) $F_{ext}(z \cong H) = 10 \times 10^{-4} \times 1{,}0 \times 10^3 \times 2^2/2 = 2{,}0\ N$ (LLENO)

$F_{ext}(z \cong 0) = 10 \times 10^{-4} \times 1{,}0 \times 10^3 \times (9{,}8 \times 0{,}4 + 2^2/2) = 5{,}92\ N$ (CASI VACÍO)

c)



$f_1 \cong \frac{v_s}{8H} = 107\ Hz.$