1

a) $P_A = P_0 + \rho g h_2 \Rightarrow \boxed{P_A = 137,1\ kPa}$

$P_B = P_0 + \rho g (h_1 - H) \Rightarrow \boxed{P_B = 126,1\ kPa}$

b) $P_B + \rho g H + \frac{1}{2}\rho v_B^2 = P_A + 0 + \frac{1}{2}\rho v_A^2$

$v_B = \left(\frac{S_A}{S_B}\right) v_A \qquad \frac{S_A}{S_B} = \left(\frac{d_A}{d_B}\right)^2$

$v_A^2 = \frac{2g(h_1 - h_2)}{1 - (S_A/S_B)^2} \Rightarrow \boxed{v_A = 0,82\ m/s}$

$\phi_m = \rho S_A v_A \Rightarrow \boxed{\phi_m = 69,5\ kg/s}$

2

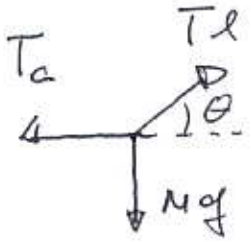
$l = L - a$

$\lambda_n^a = \frac{2a}{n} \qquad \lambda_m^l = \frac{2l}{m}$

$n, m \rightarrow$ enteros

$\Rightarrow \quad \lambda_n^a f = v^a \qquad \lambda_m^l f = v^l$

$v^a = \sqrt{\frac{T_a}{\mu}} \qquad v^l = \sqrt{\frac{T_l}{\mu}}$



$T_a = T_l \cos\theta$

$Mg = T_l \sin\theta$

$f \rightarrow$ la misma para ambos tramos

$$\frac{\lambda_n^a}{\lambda_m^l} = \sqrt{\frac{T_a}{T_l}} = \sqrt{\cos\theta} = \frac{1}{\sqrt{2}}$$

$$\frac{a}{n} \cdot \frac{m}{l} = \frac{1}{\sqrt{2}} \Rightarrow \boxed{\frac{a}{L-a} = \frac{n}{\sqrt{2}\, m}}$$

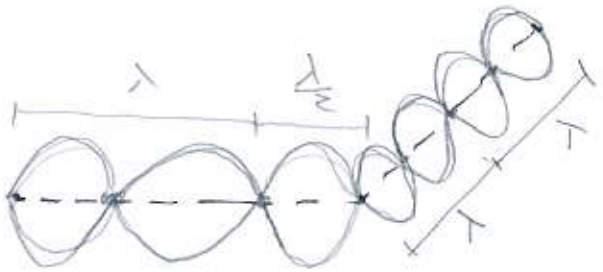
b) $L = 1,\!m$, $M = 2\,Kg$

$a = 34,6\,cm$ $\mu = 0,02\,g/cm$ $\Rightarrow \frac{n}{m} = 0,75 = \frac{3}{4}$

$n = 3$, $m = 4$ $\Rightarrow f = \frac{v^a}{\lambda_3^a} = \sqrt{\frac{T_a}{\mu}} \cdot \frac{3}{2a}$

$$\boxed{f = 326,1\,Hz}$$

c)



3 $f_0 = 10 \times 10^6\,Hz$ $f = 11,6\,kHz$

$f_1 = f_0 - f$ $v_n = 0,7\,m/s$

$v_{sangre} = v$ $v_s = 1540\,m/s$

$$f_1 = \frac{f_0 (1 - v/v_s)}{1 + v/v_s} \Rightarrow \boxed{v = 0,89\,m/s}$$

$S v = S_n v_n \Rightarrow \frac{S}{S_n} = \frac{v_n}{v} = 0,78$

$\Rightarrow$ Estrechamiento de 22%.

4 a) $\frac{P_1}{4\pi R_1^2} = \frac{P_2}{4\pi R_2^2}$ $\qquad R_1 + R_2 = 10\ m$

$\Rightarrow$ $\boxed{R_1 = 2,5\ m}$

b) $I^{(1)} = 10 \log_{10} \frac{I^{(1)}}{I_0} \Rightarrow \boxed{I^{(1)} = 109,5\ dB}$

c) $I^T = 10 \log_{10} 2\frac{I^{(1)}}{I_0} \Rightarrow \boxed{I^{(T)} = 112,5\ dB}$

5 a) $\frac{T}{\mu} = v^2$;

si $y = f(x')$ con $x' = x - vt$

$\frac{\partial^2 y}{\partial t^2} = v^2 \frac{\partial^2 f}{\partial x'^2}$; $\frac{\partial^2 y}{\partial x^2} = \frac{\partial^2 f}{\partial x'^2}$

$\Rightarrow \frac{1}{v^2}\frac{\partial^2 y}{\partial t^2} = \frac{\partial^2 y}{\partial x^2} \Rightarrow \frac{\partial^2 y}{\partial t^2} - v^2 \frac{\partial^2 y}{\partial x^2} = 0$

b) Si $v_0 = 0$ y $P = P_{max}$

$P_{max} = \frac{1}{2}\rho v_s^2 + P_s$ $\Rightarrow$ $P_s - P_i = \frac{1}{2}\rho(v_i^2 - v_s^2)$

$P_{max} = \frac{1}{2}\rho v_i^2 + P_i$

Para subir $P_s - P_i < 0 \Rightarrow v_i < v_s$

$\Rightarrow \underline{\underline{\alpha < 1}}$.