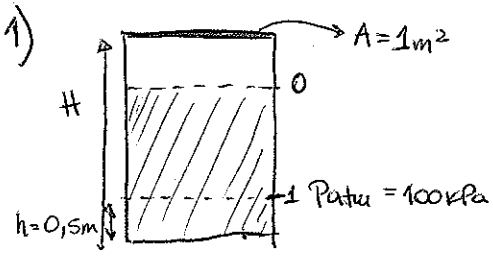
Física 2 – Examen 2 de Agosto de 2024 –

1)



Datos: $\rho = 1\times10^3\ kg/m^3$, $H = 3,5m$, $T = 297K$

a) $P_1 = P_0 + \rho g h'$ con $h' = 2m$

$P_0 = 200\ kPa - 19600\ Pa$

$\boxed{P_0 = 180\,400\ Pa}$

Gas ideal: $\frac{P_0 V}{RT} = n$

$\boxed{n = 73,1\ mol}$

b) $P_0 + \rho g h' + \frac{\rho v_1^2}{2} = P_{atm} + \rho g h'' + \frac{\rho v_2^2}{2}$ ($v_2 \gg v_1$; $h'' = 0$)

$200\ kPa$

$\frac{100kPa \cdot 2}{\rho} = v_2^2 \longrightarrow \boxed{v_2 = 14,14\ m/s}$

c) La descarga termina cuando $v = 0$

$P_{atm} = P_{gas} + \rho g h \longrightarrow P_{atm} = \frac{RnT}{A(3-h)} + \rho g h \longrightarrow 120 + 9,8h^2 - 129h = 0$

Soluciones: $\boxed{1m}$; Sin sentido ← 12m

Altura final: $\boxed{h_f = 1,5m}$ desde la base

d) Proceso isotermo $\xrightarrow{\Delta U = 0J}$ $Q = -W \longrightarrow W_{isot} = -nRT\ln\left(\frac{V_2}{V_1}\right) \longrightarrow \boxed{W_{isot} = -125\ kJ}$

2) $\mu = 0,005\ kg/m$, $L_1 = 0,52m$, $L_2 = 0,46m$, $T_1 = 150N$, $v = \sqrt{\frac{T}{\mu}}$

a) $v_1 = 173,2\ m/s$

$f_{o_1} = \frac{v}{2L_1} = 166,5Hz$

$f_{n_2} = \frac{v_2}{\lambda_n} = \frac{\sqrt{\frac{T_2}{\mu}}}{\frac{2L_2}{n}} = f_{o_1}$

$\boxed{T_2 = \mu\cdot\left(\frac{2L_2 \cdot f_{o_1}}{n}\right)^2} \longrightarrow \boxed{T_2 = T_1\left(\frac{L_1}{L_2}\right)^2\frac{1}{n^2}} \longrightarrow \boxed{T_{21} = 117,3\ N,\ T_{22} = 29,3\ N}$

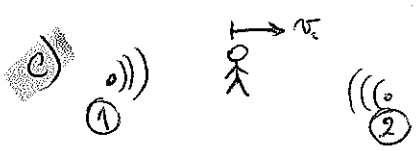
b) $T_2 = 115N$

$v_2 = 151,7\ m/s$

$f_{o_2} = 164,84Hz$

$\boxed{f_{bat} = 1,65Hz}$

c)



Doppler: $f' = f_s\left(\frac{v \pm v_o}{v}\right)$

$f_1' = 166,5Hz\left(\frac{340m/s - v_o}{340m/s}\right)$

$f_2' = 164,8Hz\left(\frac{340m/s + v_o}{340m/s}\right)$

Son iguales si no hay batido

$\boxed{v_o = 1,7\ m/s}$ Hacia la fuente 2

3) $n = 1\ mol$

$\gamma = \frac{5}{3}$ $C_p = \frac{5}{2}R$ $C_v = \frac{3}{2}R$

a) Estados:

	P(kPa)	V(m³)	T(K)
1	120	0,015	216
2	120	0,022	317
3	170	0,022	450

Trabajo, Calor y ΔS

	Q(kJ)	W(kJ)	ΔS(J/K)
1-2	2,100	-0,840	7,961
2-3	1,652	0	4,349
3-4	-3,928	1,015	-12,310

(1-2) $\Delta U = nC_v\Delta T = 1259,6\ J$

$Q = nC_p\Delta T = 2,100\ kJ$

$W = \Delta U - Q = -0,840\ kJ$

$\Delta S = nC_p\ln\left(\frac{T_2}{T_1}\right) = 7,961\ J/K$

(2-3) $W = 0$

$\Delta U = Q = 1,652\ kJ$

$\Delta S = nC_v\ln\left(\frac{T_3}{T_2}\right)$

$\Delta S = 4,349\ J/K$

(3-1) $W = \frac{\Delta V(P_1 + P_3)}{2}$

$W = 1015\ J$

$\Delta U = -2918\ J$