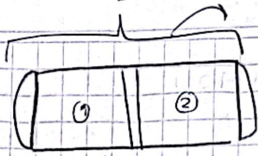
Piston en equlibrio a

$L = \frac{1}{3}$

L



$L - \frac{L}{3}$ $\qquad \frac{L}{3}$ gas monoatomica

– 1 mol gas ideal monoatomico

$T = ?$

– 400 K

Inductividad de
$k = 389,6$
$A = 0,01\ m^2$
$L = 0,30\ m$

a.) $T_0^2 = 200k.$ =

Como es un gas ideal usamos las ecuaciones
$$\begin{cases} P_1V_1 = nRT_1 \\ P_2V_2 = nRT_2 \end{cases}$$

$P_1 = \frac{nRT_1}{V_1}$

$P_2 = \frac{nRT_2}{V_2}$

En equibrio cuado P_1 es igual a P_2

Entonces $\frac{nRT_1}{V_1} = \frac{nRT_2}{V_2}$

despejamos para T_2 $\qquad$ remplazando

$T_2 = T_1 \frac{V_2}{V_1}$ $\qquad T_2 = 400K \frac{V_2}{V_1}$

Como sabemos que es un cilindro entonces calculamos su volumen como

$V = Ab \times h = \pi r^2 \times h$

$h \begin{cases} ① & L - L/3 \\ ② & L/3 \end{cases}$

$V_1 = \left(L - \frac{L}{3}\right) \cdot \pi r^2$

$= \frac{\pi r^2 2L}{3}$

$V_2 = \left(\frac{L}{3}\right) \cdot \pi r^2$

$= \frac{L\pi r^2}{3}$

$T_2 = 400K \frac{\frac{\pi r^2 L}{3}}{\frac{\pi r^2 2L}{3}}$

$T_2 = \frac{400K}{2}$

$T_2 = 200K$

$C = \frac{KA}{nC_vL}$ $C_v = \frac{3}{2}R$

b.)

$$nC_v \frac{dT_1}{dt} = -\frac{KA}{L}(T_1 - T_2)$$

$$nC_v \frac{dT_2}{dt} = \frac{KA}{L}(T_1 - T_2)$$

$$\left.\frac{dT_1}{dt}\right|_{t=0} = -C(T_1^0 - T_2^0)$$

$$\left.\frac{dT_2}{dt}\right|_{T=0} = C(T_1^0 - T_2^0)$$

la primera ley dice $\Delta U = nC_v\Delta T$ $\Delta W = 0$

$= \Delta Q - \Delta W$

Entonces $dU = nC_v dT = dQ$

Usando la ley de la tranferencia de calor

$$nC_v \frac{dT_1}{dt} = -\frac{KA}{L}(T_1 - T_2)$$

como $C = \frac{KA}{nC_vL}$ Entonces

$$\frac{dT_1}{dt} = -C(T_1 - T_2)$$

$$\frac{dT_2}{dt} = \frac{KA}{L}(T_1 - T_2)$$

$$\frac{dT_2}{dt} = C(T_1 - T_2)$$

Entonces

$$\left.\frac{dT_1}{dt}\right|_{t=0} = -C(400 - 200)$$
$$-C(200)$$

$$\left.\frac{dT_1}{dt}\right|_{t=0} = C(400 - 200)$$
$$= C(200)$$

c)

$$\begin{pmatrix} \frac{dT_1}{dt} \\ \frac{dT_2}{dt} \end{pmatrix} = C \begin{pmatrix} -(T_1 - T_2) \\ (T_1 - T_2) \end{pmatrix}$$

$$\begin{pmatrix} \frac{dT_1}{dt} \\ \frac{dT_2}{dt} \end{pmatrix} = -C \underbrace{\begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix}}_{A} \begin{pmatrix} T_1 \\ T_2 \end{pmatrix}$$

$\det(A - r\mathbb{I})$

$$\det(A) = \begin{pmatrix} r+C & -C \\ -C & r+C \end{pmatrix} \quad F_2 \to F_2 + F_1 \begin{pmatrix} -C \\ 0 \end{pmatrix}$$

$$\det(A) = r^2 + 2c + c^2 - c^2 = 0$$

$$r(r+2c) \quad \begin{cases} r = 0 \\ r = -2c \end{cases}$$

$r = 0$

$$\begin{pmatrix} c & -c \\ -c & c \end{pmatrix} \begin{pmatrix} a_1 \\ a_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} a_1 \\ a_2 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

$r = -2c$

$$\begin{pmatrix} c & -c \\ -c & c \end{pmatrix} \begin{pmatrix} a_1 \\ a_2 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} a_1 \\ a_2 \end{pmatrix} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

$$T_1 = C_1 + C_2 e^{-2ct}$$

$$T_2 = C_1 - C_2 e^{-2ct}$$