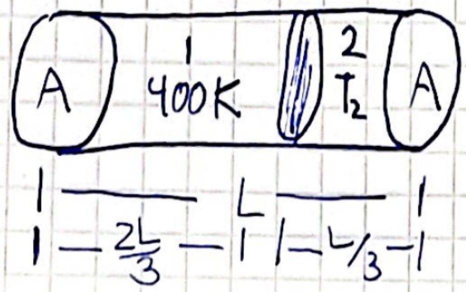
0.3 Termodinamica

a.)



$PV = nRT \quad n = 1\,mol \quad V = AL$

$$\frac{PAL}{T} = R$$

$$\frac{P_1 A_1 L_1}{T_1} = \frac{P_2 A_2 L_2}{T_2}$$

Para que halla equilibrio:

$P_1 = P_2 \quad A_1 = A_2$

$$\frac{L_1}{T_1} = \frac{L_2}{T_2} \qquad L_1 = \frac{2L}{3} \qquad L_2 = \frac{L}{3}$$

$$\frac{2L}{3T_1} = \frac{L}{3T_2} \qquad \frac{T_1}{2} = T_2 \qquad T_1 = 400\,K \quad \therefore \underline{T_2 = 200\,K}$$

b.) $dU = dQ - dW \quad dW = 0 \quad dU = nc_v dT$

$$nc_v dT = dQ \quad nc_v \frac{dT}{dt} = \frac{dQ}{dt}$$

La Ley de Fourier dice: $\frac{dQ}{dt} = -KA\frac{\Delta T}{\Delta X} \quad \Delta X = l$

$$\therefore nc_v \frac{dT}{dt} = -KA\frac{\Delta T}{l} \quad C = \frac{KA}{nc_v l}$$

$$\frac{dT}{dt} = -C\Delta T$$

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

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

Evaluando en $t=0$:

$$\left.\frac{dT_1}{dt}\right|_0 = -C(T_1^0 - T_2^0)$$

$$\left.\frac{dT_2}{dt}\right|_0 = C(T_1^0 - T_2^0)$$

c.) $T_1' = -C(T_1 - T_2)$ $T_2' = C(T_1 - T_2)$ $D[T] = T'$

$T_1(D+C) - CT_2 = 0$ $T_2(D+C) - CT_1 = 0$

$$\begin{vmatrix} D+C & -C \\ -C & D+C \end{vmatrix} = (D+C)^2 - C^2 = D^2 + 2DC$$

$(D^2 + 2DC)T = 0 \Rightarrow T_1'' + 2CT_1' = 0$ $T_2'' + 2CT_2' = 0$

$r^2 + 2Cr = 0$ $r = \frac{-2C \pm 2C}{2}$ $r_1 = 0$ $r_2 = -2C$

$T_1 = Ae^{-2Ct} + B$ $T_2 = Ce^{-2Ct} + D$

$-2CAe^{-2Ct} = -CAe^{-2Ct} - BC + CCe^{-2Ct} + DC$

$-2A = -A + C$ $D = B$ $A = -C$

$T_1 = Ae^{-2Ct} + B$ $T_2 = -Ae^{-2Ct} + B$

$T_1(0) = 400\,K = A + B$ $T_2(0) = 200K = -A + B$

$600\,K = 2B$ $B = 300\,K \Rightarrow A = 100\,K$

$\underline{T_1 = 100e^{-2Ct} + 300}$ $\underline{T_2 = -100e^{-2Ct} + 300}$

d.) Computacional

e.) $\lim_{t \to \infty} T_1(t) = 300$ $\lim_{t \to \infty} T_2(t) = 300$ $T_1(\infty) = T_2(\infty)$

En infinito se alcanza el equilibrio termico.