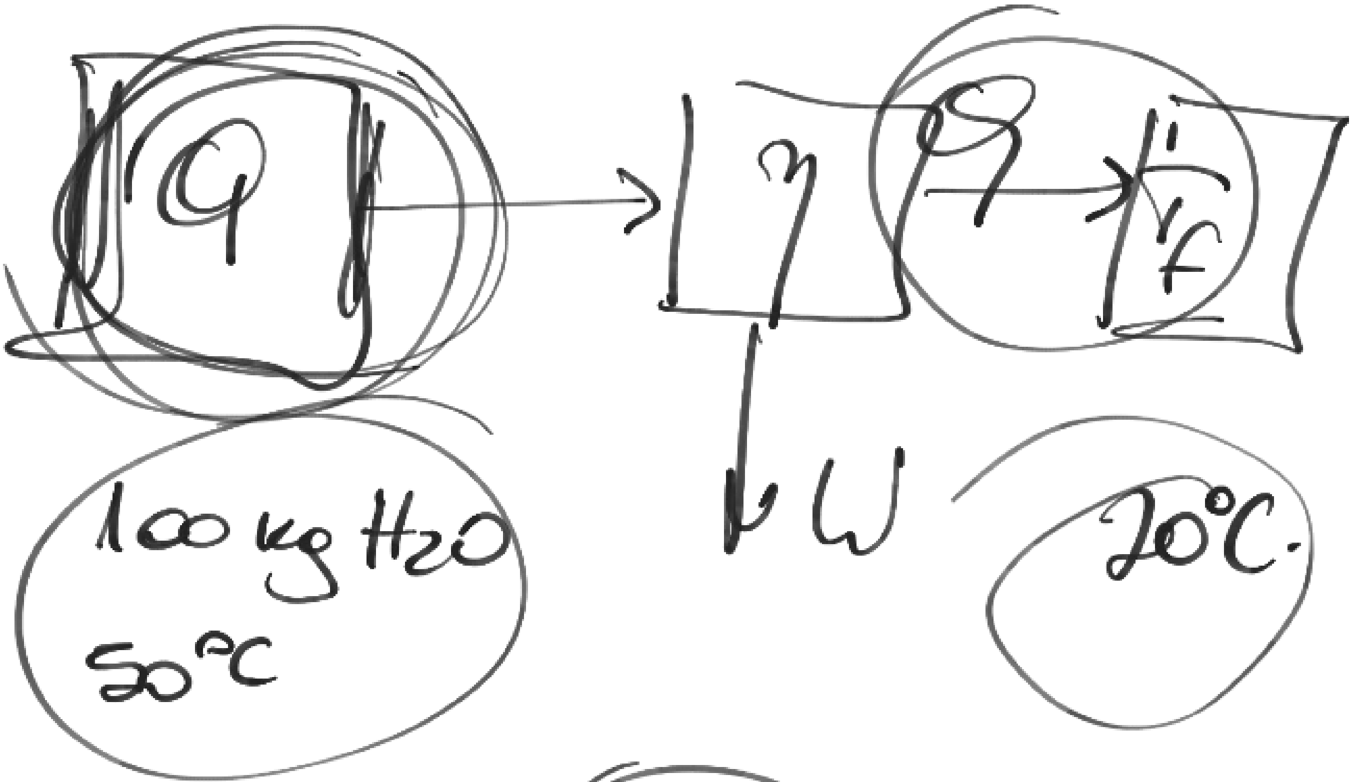
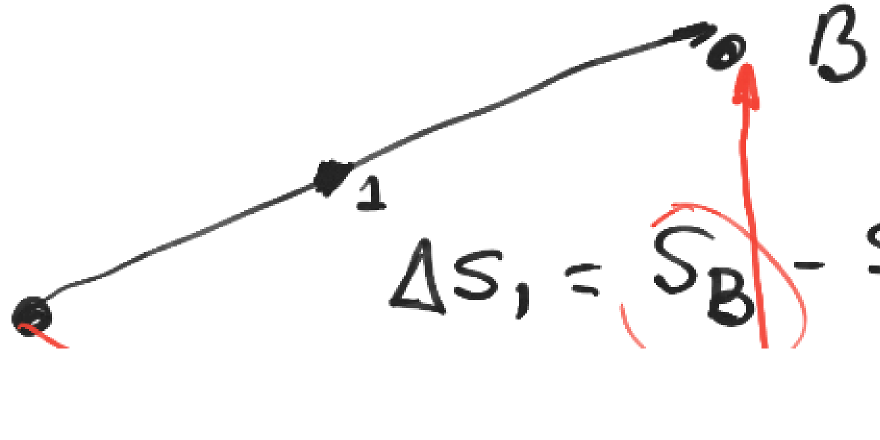
f3b-20190502-U03C04-Entropia-2_apuntes



$$Q = C_{H_2O} \cdot m \, \Delta T$$

30K

$$Q = 4.184 \frac{J}{\cancel{g}\,\cancel{K}} \cdot 100.000\,\cancel{g} \cdot 30\,\cancel{K}$$



$$\Delta S_1 = S_B - S_A$$

$$\Delta S = (S_B - S_O) - (S_A - S_O)$$
$$= S_B - \cancel{S_O} - S_A + \cancel{S_O}$$
$$\Delta S = S_B - S_A$$

$$dS = \frac{dQ_R}{T} \Rightarrow [S] = J/K$$

Gas ideal $\quad dQ_R = dU + dW_R$

$$T\,dS = dU + dW_R \qquad T \text{ y } V$$

$$dU = C_v\, n\, dT \qquad dW_R = p\, dV$$

$$T\, dS = C_v\, n\, dT + p\, dV \qquad \frac{p}{T} = \frac{nR}{V}$$

$$dS = C_v\, n \left(\frac{dT}{T}\right) + nR\left(\frac{dV}{V}\right)$$

$$\int_A^B dS = \int_A^B n\, C_v \left(\frac{dT}{T}\right) + \int_A^B nR \left(\frac{dV}{V}\right)$$

a p = ct

$$\boxed{\Delta S = S_B - S_A = n\, C_v \ln\left(\frac{T_B}{T_A}\right) + nR \ln\left(\frac{V_B}{V_A}\right)}$$

$$\Delta S = n\, C_v \ln T_B/T_A + nR \ln V_B/V_A$$

$$PV = nRT \rightarrow V = nRT/P$$

$$\left(\ln \frac{V_B}{V_A}\right) = \ln\left(\frac{\cancel{n}\cancel{R}T_B/P_B}{\cancel{n}\cancel{R}T_A/P_A}\right)$$

T y P

$$= \ln\left(\frac{T_B}{T_A} \cdot \frac{P_A}{P_B}\right) = \ln \frac{T_B}{T_A} + \ln \frac{P_A}{P_B}$$

$$\Big(T_A \quad P_B \Big) \quad T_A \quad P_B$$

$$= \ln \frac{T_B}{T_A} - \ln \frac{P_B}{P_A}$$

$$\Delta S = n\,C_v \ln T_B/T_A + nR\left[\ln \frac{T_B}{T_A} - \ln \frac{P_B}{P_A}\right]$$

$$= n\,\underbrace{(C_v + R)}_{C_p} \ln \frac{T_B}{T_A} - nR \ln P_B/P_A$$

$$\boxed{\Delta S = n\,C_p \ln\left(\frac{T_B}{T_A}\right) - nR \ln \frac{P_B}{P_A}}$$

a $V = cte$

$\Delta S \longrightarrow p$ y V.

$$pV = nRT \Rightarrow T = pV/nR$$

$$\Delta S = n\,C_p \ln\left(\frac{p_B V_B/\cancel{nR}}{p_A V_A/\cancel{nR}}\right) - nR \ln \frac{P_B}{P_A}$$

$$\Delta S = nC_p\left(\ln \frac{P_B}{P_A} + \ln \frac{V_B}{V_A}\right) - nR \ln P_B/P_A$$

$$= nC_p \ln \frac{P_B}{P_A} + nC_p \ln \frac{V_B}{V_A} - nR \ln P_B/P_A$$

$$= n\underbrace{(C_p - R)}_{C_v} \ln P_B/P_A + nC_p \ln \frac{V_B}{V_A}$$

$$\Rightarrow \boxed{\Delta S = n\, C_v \ln\left(\frac{P_B}{P_A}\right) + n\, C_p \ln \frac{V_B}{V_A}}$$

$\Delta S \rightarrow P$ y V

Proceso Adiabático

$$\Delta S = nC_p \ln V_B/V_A + nC_v \ln P_B/P_A$$

$$\Delta S = nC_v\left[\frac{C_p}{} \ln \frac{V_B}{} + \ln \frac{P_B}{}\right)$$

$\left[C_v \right]^{\gamma} \quad V_A \quad P_A \Big]$

$$\left(\frac{\Delta S}{nC_v}\right) = \ln\left(\frac{V_B}{V_A}\right)^{\gamma} + \ln\left(\frac{P_B}{P_A}\right)$$

$$= \ln \frac{V_B^{\gamma}}{V_A^{\gamma}} + \ln \frac{P_B}{P_A}$$

$$\frac{\Delta S}{nC_v} = \ln\left(\frac{P_B \, V_B^{\gamma}}{P_A \, V_A^{\gamma}}\right)$$

$$e^{(\Delta S/nC_v)} = \frac{P_B \, V_B^{\gamma}}{P_A \, V_A^{\gamma}}$$

$$\Rightarrow P_B V_B^{\gamma} = e^{(S_B - S_A)/nC_v} \, P_A V_A^{\gamma}$$

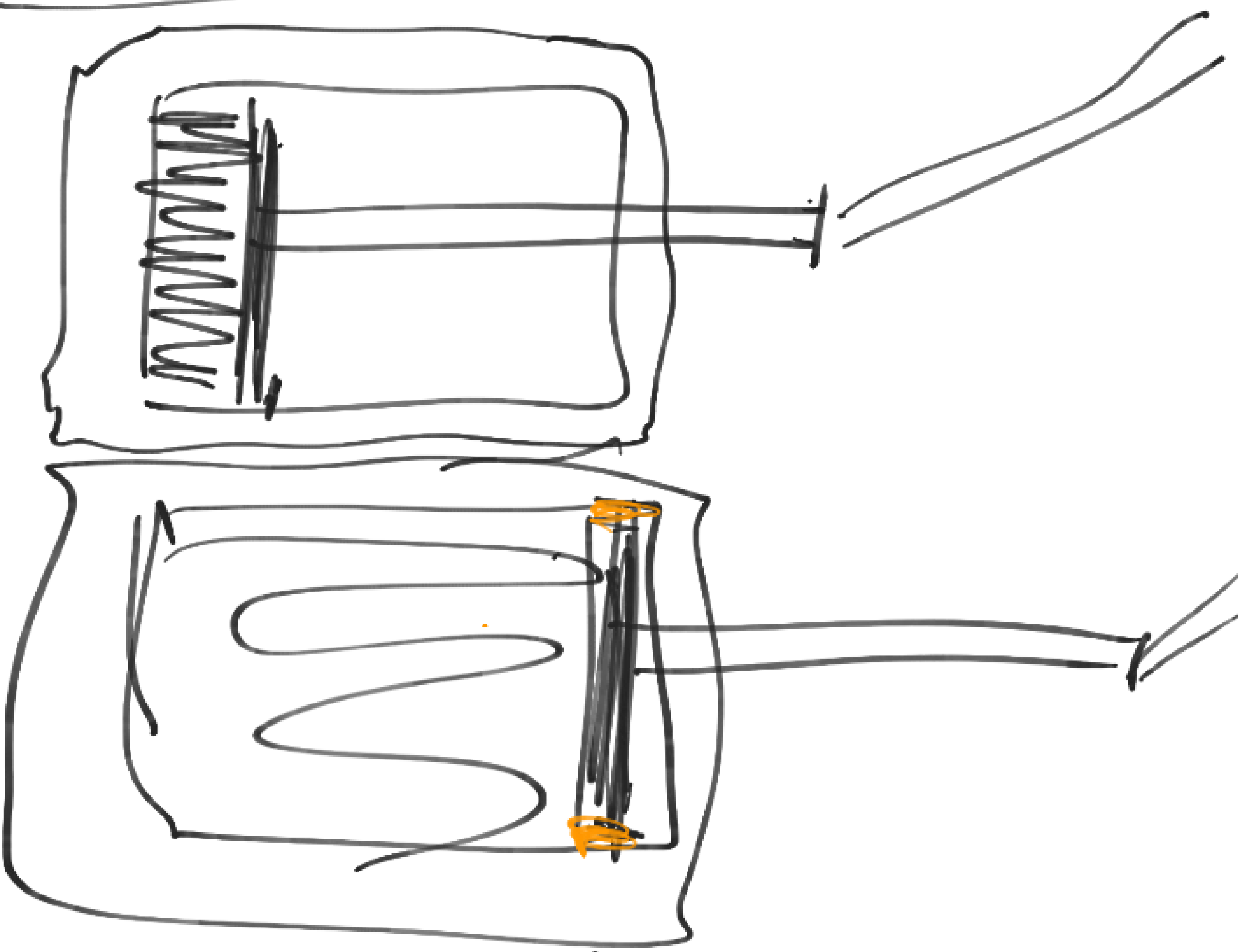
$$P_B V_B^{\gamma} = P_A V_A^{\gamma}$$

Un proceso adiabático verifica

que $S_B = S_A$ = cte

$$e^{\Delta S / nC_V} = 1 \text{ si es isoentrópico}$$

un proceso isoentrópico es Adiabático



$Q = \Delta U + W$ y $Q = 0$

$$\Rightarrow W = -\Delta U$$

$$p_A V_A^{\gamma} e^{-S_A/nC_V} = p_B V_B^{\gamma} e^{-S_B/nC_V}$$

$$dS = \frac{dQ_e}{T} \Rightarrow \int dQ_e = \int T\,dS$$

$$Q_R = T\Delta S$$

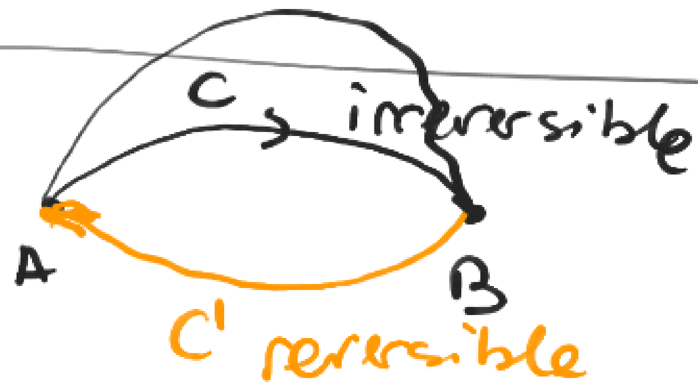
$$f(x) = e^{-(x^2/2\sigma)\cdot\pi}$$

$$f(x) = \exp\left[-\frac{x^2}{2\sigma}\cdot\pi\right]$$

$$T_B = T_A\, e^{\frac{S_B - S_A}{nC_p}}$$

$$= \quad \left(S \quad S \right)$$

$$= T_A \exp\left(\frac{S_B - S_A}{n C_p}\right)$$



$$\oint \frac{dQ}{T} < 0 = \int_{C\,A}^{B} \frac{dQ_I}{T} + \int_{C'\,B}^{A} \frac{dQ_R}{T} < 0$$

$$-\int_{C'\,B}^{A} \frac{dQ_R}{T} > \int_{C\,A}^{B} \frac{dQ_I}{T}$$

$$\underbrace{\int_{C'\,A}^{B} \frac{dQ_R}{T}}_{\Delta S = S_B - S_A} > \int_{A}^{B} \frac{dQ_I}{T}$$

$$\Delta S = S_B - S_A > \underbrace{\int_{A}^{B} \frac{dQ_I}{T}}$$

$$\int^{B}$$

$$\Delta S = \int_A \frac{dQ_R}{T}$$

$$\oint \frac{dQ}{T} \leq 0 \rightarrow \Delta S \geq \int_A^B \frac{dQ_R}{T}$$

Última modificación: 15:52