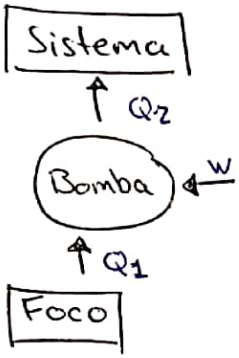
Entregable individual 2. Jorge González Pereda. Grupo A. DNI: 51553561G

1.



$T_F = 20°C = 293'15\ K \quad T_s = 90°C = 363'15\ K$

$T_{ext} = 20°C = 293'15\ K$

$\Delta S = -60\ J/K \quad ¿W?$

$dU = 0 \Rightarrow dU = \delta Q + \delta W \Rightarrow W = -Q = -(Q_1 - Q_2)$

Es reversible $\Rightarrow \Delta S_{sist} + \Delta S_F + \Delta S_{Bomba} = 0$

$$\Delta S_{sist} - \frac{Q_F}{T_F} + \frac{Q_{Bomba}}{T_{Bomba}}\overset{0}{\cancel{\ }} = 0 \Rightarrow \Delta S_{sis} - \frac{Q_1}{T_F} = 0 \Rightarrow \Delta S_{sist} = \frac{Q_1}{T_F} = 60\ J/K$$

$\boxed{Q_1 = 17589\ J}$ → $\delta Q^{rev} = C_v dT$ porque $dU_F = \delta Q_F^{rev}$, ya que $W_F = 0$

$$\Delta S_{sist} = \int_{T_1}^{T_2} \frac{\delta Q^{rev}}{T} = \int_{T_1}^{T_2} \frac{C_v\, dT}{T} = C_v \ln\left(\frac{T_2}{T_1}\right) \Rightarrow C_v = \frac{\Delta S_{sist}}{\ln\left(\frac{T_2}{T_1}\right)} = \frac{60}{\ln\left(\frac{363'15}{293'15}\right)} = 280'2\ J/K$$

$\boxed{Q_2 = C_v \Delta T = 19.614'11\ J} \Rightarrow \boxed{W = -(Q_1 - Q_2) = 2.025'11\ J}$

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2. $C_p = \alpha p^2 T \qquad \alpha = \frac{T}{V} F(p) \qquad \kappa_T = a\frac{T^2}{V}$

a) $\frac{\partial}{\partial p}\left(\frac{\partial V}{\partial T}\right)_p = \frac{\partial}{\partial T}\left(\frac{\partial V}{\partial p}\right)_T$

$$\left.\begin{aligned} \alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p &\Rightarrow \frac{dV}{\partial T} = V\alpha = TF(p) \\ \kappa_T = -\frac{1}{V}\left(\frac{\partial V}{\partial p}\right)_T &\Rightarrow \frac{\partial V}{\partial p} = -V\kappa_T = aT^2 \end{aligned}\right\} \frac{\partial}{\partial T}(aT^2) = \frac{\partial}{\partial p}(TF(p))$$

$$-2aT = T\frac{\partial}{\partial p}F(p) \Rightarrow \frac{\partial F(p)}{\partial p} = -2a \Rightarrow \boxed{F(p) = -2ap}$$

$$dS = \frac{\delta Q}{T} = C_p \frac{dT}{T} \Rightarrow S = \int ap^2 T \frac{dT}{T} = ap^2 T \Rightarrow \boxed{S(T,p) = ap^2 T}\ \text{salvo cte.}$$

b) $dU = \left(\frac{\partial V}{\partial T}\right)_p dT + \left(\frac{\partial V}{\partial p}\right)_T dp = V\alpha dT - V\kappa_T dp \Rightarrow \frac{dV}{V} = \alpha dT - \kappa_T dp$