Clase 32 28 octubre 2020

Título de la nota 28/10/2020

$$q = 0 \begin{cases} R \\ IR \end{cases}$$

$$\boxed{\begin{array}{l} \Delta U = -W \quad \text{exp } W = + \\ W = -\Delta U \quad \Delta U = - \quad \Delta T = - \\ \qquad\qquad\qquad \text{sist. enfría.} \end{array}}$$

$$\frac{cal}{^{\circ}C} = \Delta S_{IR} > 0$$

Adiabático Irreversible (IR)

$$\Delta U = -w$$

$$\boxed{p = \frac{nRT}{V}}$$

$$n\bar{C}_v\, dT = -p\, dv$$

$$n\bar{C}_v (T_2 - T_1) = -p_2 (V_2 - V_1)$$

$$\cancel{n}\bar{C}_v (T_2 - T_1) = -p_2 \left[\frac{\cancel{n}RT_2}{p_2} - \frac{\cancel{n}RT_1}{p_1} \right] \qquad V = \frac{nRT}{p}$$

$$\bar{C}_v (T_2 - T_1) = \left[\frac{-\cancel{p_2}RT_2}{\cancel{p_2}} + \frac{Rp_2T_1}{p_1} \right]$$

$$\bar{C}_v (T_2 - T_1) = R \left[\frac{p_2 T_1}{p_1} - T_2 \right]$$

$$T_2 - T_1 = \frac{R}{\bar{C}_V}\left[\frac{p_2 T_1}{p_1} - T_2\right] \qquad R = \bar{C}_p - \bar{C}_V$$

$$T_2 - T_1 = \frac{\bar{C}_p - \bar{C}_V}{\bar{C}_V}\left[\frac{p_2 T_1}{p_1} - T_2\right]$$

$$T_2 - T_1 = (\gamma - 1)\left[\frac{p_2 T_1}{p_1} - T_2\right]$$

$$T_2 = (\gamma - 1)\left[\frac{p_2 T_1}{p_1} - T_2\right] + T_1$$

$$T_2 = \left[(\gamma - 1)\frac{p_2 T_1}{p_1} - (\gamma - 1) T_2\right] + T_1$$

$$T_2 + T_2(\gamma-1) = (\gamma-1)\frac{p_2}{p_1}T_1 + T_1$$

$$\cancel{T_2} + T_2\gamma - \cancel{T_2} = T_1\left[(\gamma-1)\frac{p_2}{p_1} + 1\right]$$

$$\boxed{T_2 = \frac{T_1}{\gamma}\left[(\gamma-1)\frac{p_2}{p_1} + 1\right]}$$

$$T_2 = \frac{T_1}{\chi}\left[(\chi-1)\frac{p_2}{p_1} + 1\right]$$

$K = k$

$T_2 = T_1$ $\chi = 1$

$$T_2 = \frac{T_1}{1}\left[(1-1)\frac{p_2}{p_1} + 1\right]$$

Isotérmico

Obtener p, V

$$\frac{T_2}{T_1} = \frac{1}{\gamma}\left[(\gamma-1)\frac{p_2}{p_1}+1\right] \qquad T=\frac{pV}{nR}$$

$$\frac{p_2V_2/\cancel{n}R}{p_1V_1/\cancel{n}R} = \frac{1}{\gamma}\left[(\gamma-1)\frac{p_2}{p_1}+1\right]$$

$$p_2V_2 = \frac{p_1V_1}{\gamma}\left[(\gamma-1)\frac{p_2}{p_1}+1\right]$$

$$p_2V_2 = \left[\frac{\cancel{p_1}V_1}{\gamma}(\gamma-1)\frac{p_2}{\cancel{p_1}} + \frac{p_1V_1}{\gamma}\right]$$

$$p_2V_2 = \left[\frac{V_1}{\gamma}(\gamma-1)p_2 + \frac{p_1V_1}{\gamma}\right]$$

$$\left\{ p_2 V_2 \gamma = V_1 \left[(\gamma-1) p_2 + p_1 \right] \right\} \frac{1}{p_2}$$

$$V_2 \gamma = V_1 \left[(\gamma-1) + \frac{p_1}{p_2} \right]$$

$$\boxed{V_2 = \frac{V_1}{\gamma} \left[(\gamma-1) + \frac{p_1}{p_2} \right]}$$

$$m^3 = m^3$$

$$p_2 V_2 = \frac{V_1}{\gamma} (\gamma-1) p_2 + \frac{V_1 p_1}{\gamma}$$

$$p_2 V_2 - \frac{V_1}{\gamma} (\gamma-1) p_2 = \frac{V_1 p_1}{\gamma}$$

$$p_2\left(V_2 - \frac{V_1}{\gamma}(\gamma-1)\right) = \frac{V_1 p_1}{\gamma}$$

$$\boxed{p_2 = \frac{\frac{V_1 p_1}{\gamma}}{\left[V_2 - \frac{V_1}{\gamma}(\gamma-1)\right]}}$$

$$\frac{N}{m^2} = \frac{N}{m^2}$$

$$\boxed{\frac{N}{m^2}} = \frac{(N/m^2)\,\cancel{m^3}}{\cancel{m^3} - \cancel{m^3}} = \boxed{\frac{N}{m^2}}$$

$$p_2 = \frac{\frac{p_1 V_1}{x}}{\left[V_2 - \frac{V_1}{x}(x-1)\right]}$$

$x = 1$ isot.

$$\boxed{p_2 = \frac{p_1 V_1}{V_2} \quad \therefore \quad p_2 V_2 = p_1 V_1 \quad \text{Isot.}}$$

Obtener relación T, V

$$T_2 = \frac{T_1}{\gamma}\left[(\gamma-1)\frac{p_2}{p_1} + 1\right] \qquad p = \frac{nRT}{V}$$

$$T_2 = \frac{T_1}{\gamma}\left[(\gamma-1)\frac{\cancel{n}RT_2/V_2}{\cancel{n}RT_1/V_1} + 1\right]$$

$$\frac{T_2}{T_1}\gamma = \left[(\gamma-1)\frac{T_2 V_1}{T_1 V_2} + 1\right]$$

$$\frac{T_2}{T_1}\gamma - \left[(\gamma-1)\frac{T_2 V_1}{T_1 V_2}\right] = 1$$

$$\frac{T_2}{T_1}\left[\gamma - (\gamma-1)\frac{V_1}{V_2}\right] = 1$$

$$\boxed{T_2 = \frac{T_1}{\left[\gamma - (\gamma-1)\frac{V_1}{V_2}\right]}}$$

$$T_2 = \frac{T_1}{\left\{\gamma - \left[(\gamma-1)\frac{V_1}{V_2}\right]\right\}}$$

$$x = 1$$

$$T_2 = \frac{T_1}{\left[x - (x-1)\frac{V1}{V2}\right]}$$

$$T_2 = \frac{T_1}{\left[1 - (1-1)\frac{V1}{V2}\right]}$$

$T_2 = T_1$

isotérmico

$$\boxed{x \neq 0, 1, \infty, \gamma}$$

politrópico

$$\Delta U = q - w$$

$$\frac{đq}{T} = dS$$

$$q = \Delta U + w$$

$$\frac{đq}{T} = \frac{dU + đw}{T}$$

$$\int_1^2 dS = \frac{dU}{T} + \frac{đw}{T}$$

$$\frac{P}{T} = \frac{nR}{V}$$

$$\Delta S_{IR} = \frac{n\bar{C}_V\, dT}{T} + P\frac{dV}{T}$$

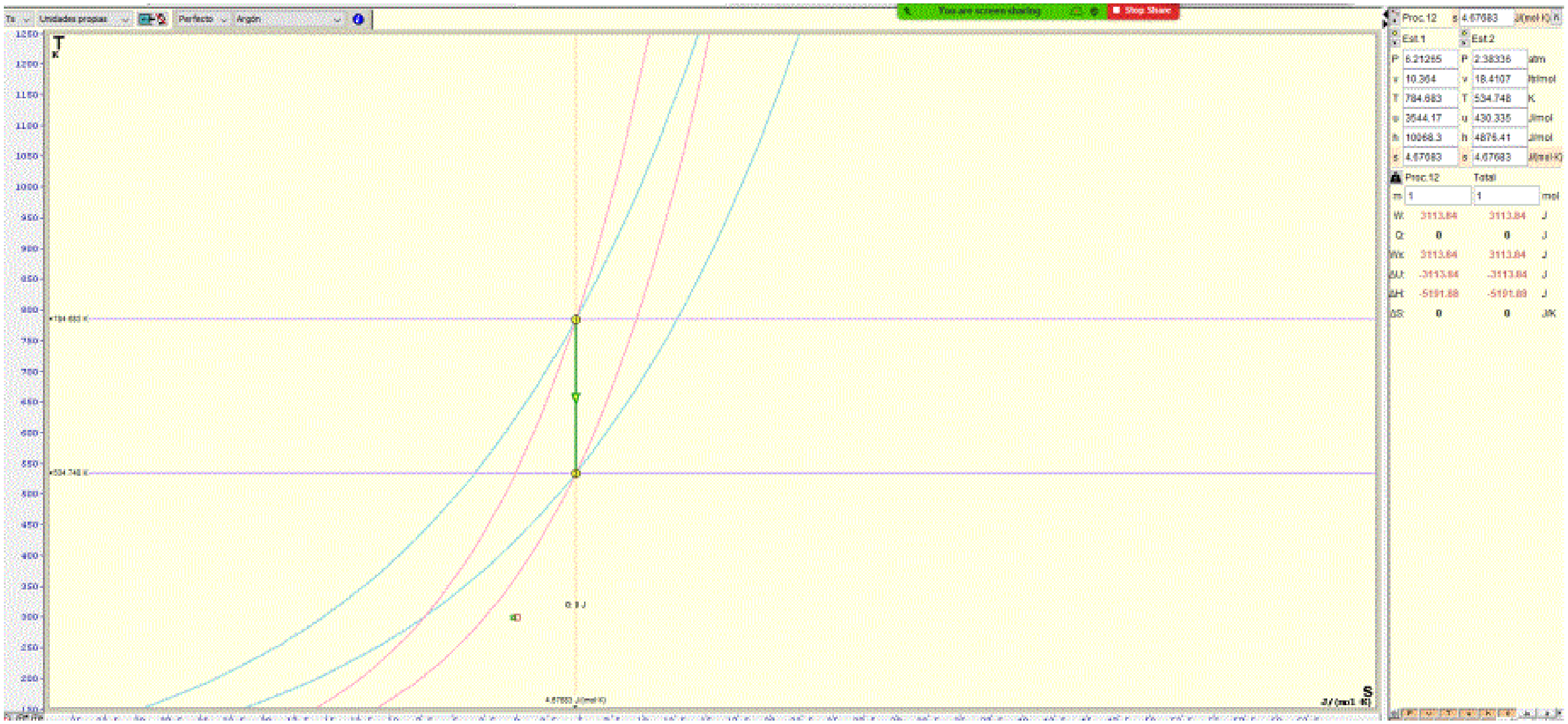
$$\Delta S_{IR} = n\bar{C}_V \int_{T_1}^{T_2} \frac{dT}{T} + \frac{P}{T}\, dV$$

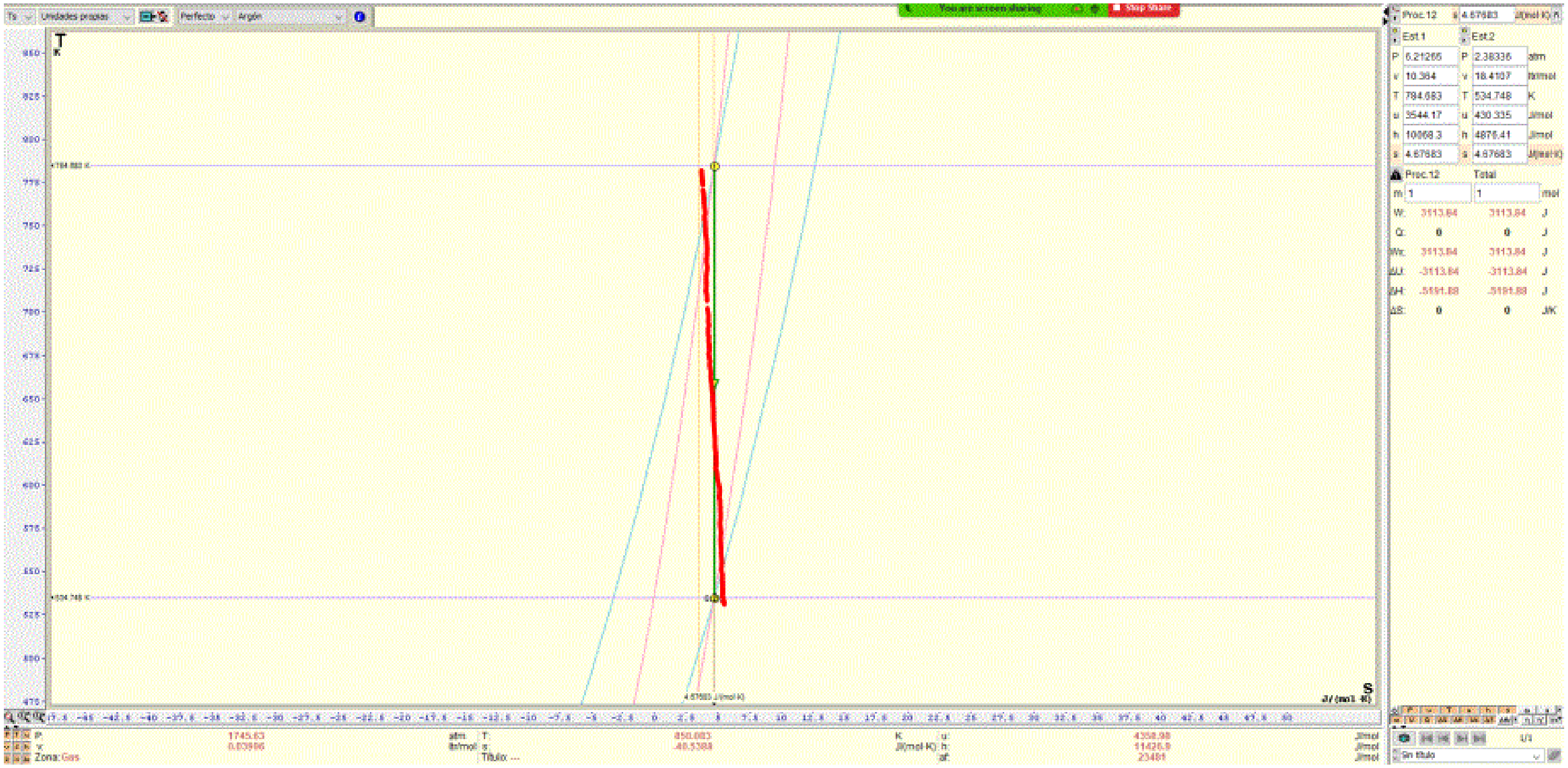
$$\Delta S_{IR} = n\bar{C}_v \int_{T_1}^{T_2} \frac{dT}{T} + nR \int_{V_1}^{V_2} \frac{dV}{V}$$

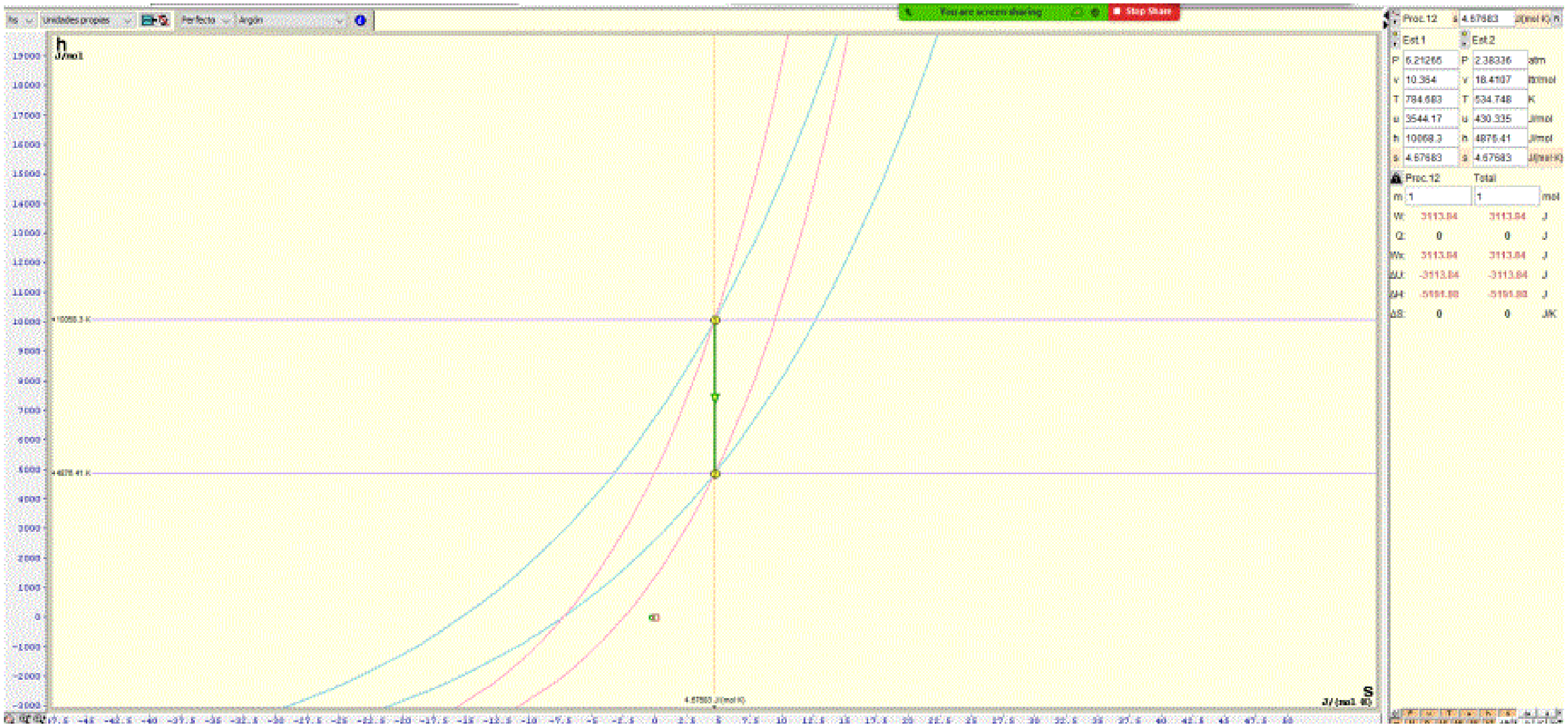
$$\boxed{\Delta S_{IR} = n\bar{C}_v \ln \frac{T_2}{T_1} \boxed{+ nR \ln \frac{V_2}{V_1}}}$$

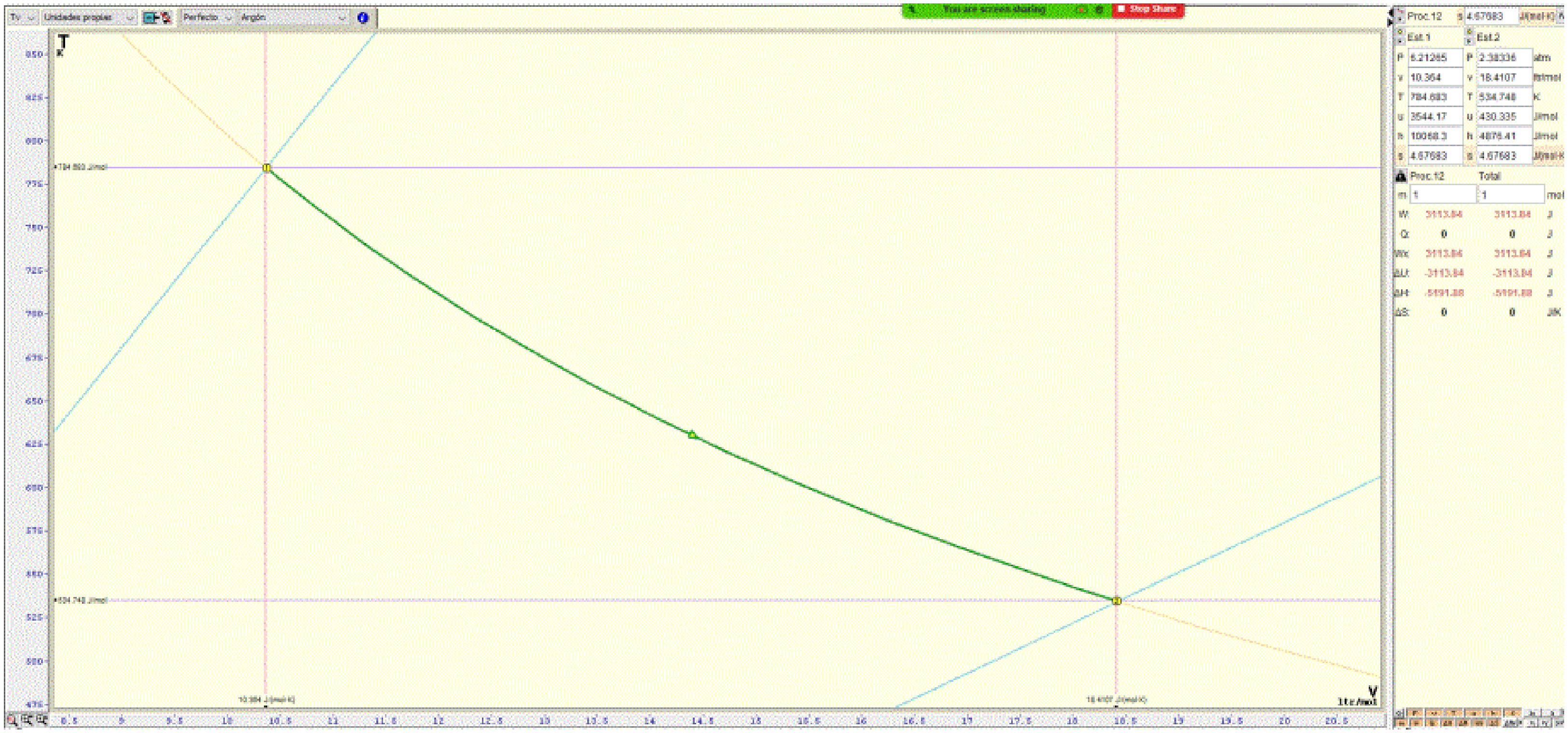
$$\Delta S_{IR} > 0$$

exp. comp.


T
K
Proc.12
Est.1
Est.2
P 6.21285 P 2.38336 atm
v 10.364 v 18.4107 litro/mol
T 784.683 T 534.748 K
u 3544.17 u 430.335 J/mol
h 10068.3 h 4876.41 J/mol
s 4.67683 s 4.67683 J/(mol·K)
Proc.12 Total
m 1 1 mol
W 3113.84 3113.84 J
Q 0 0 J
Wx 3113.84 3113.84 J
ΔU -3113.84 -3113.84 J
ΔH -5191.88 -5191.88 J
ΔS 0 0 J/K
Q: 0 J
4.67683 J/(mol·K)
S
J/(mol·K)




h
J/mol
Perfecto
Argón
Proc.12
Est.1
Est.2
P 6.21265 P 2.38336 atm
v 10.364 v 18.4107
T 784.683 T 534.748 K
u 3544.17 u 430.335 J/mol
h 10068.3 h 4876.41 J/mol
s 4.67683 s 4.67683
Proc.12 Total
m 1 1 mol
W: 3113.84 3113.84 J
Q: 0 0 J
ΔU: -3113.84 -3113.84 J
ΔS: 0 0 J/K
s


Unidades propias
Perfecto
Argón
T
K
V
ltr/mol
Proc.12
Est.1
Est.2
P 6.21265
P 2.38336 atm
v 10.364
v 18.4107 ltr/mol
T 784.683
T 534.748 K
u 3544.17
u 430.335 J/mol
h 10068.3
h 4876.41 J/mol
s 4.67683
s 4.67683 J/(mol·K)
Proc.12 Total
m 1 1 mol
W: 3113.84 3113.84 J
Q: 0 0 J
Wx: 3113.84 3113.84 J
ΔU: -3113.84 -3113.84 J
ΔH: -5191.88 -5191.88 J
ΔS: 0 0 J/K