Clase 35 19 Octubre 2021

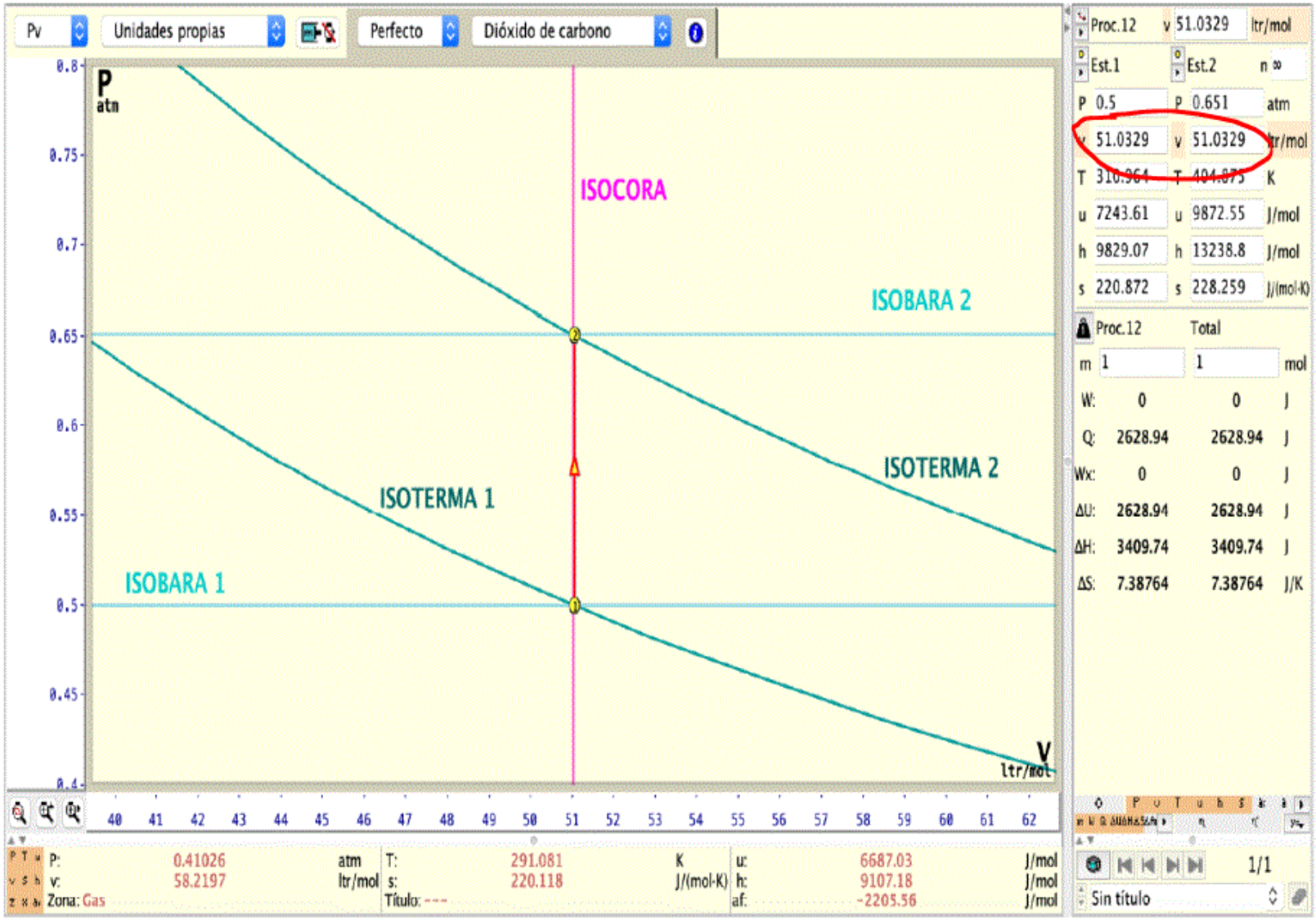
Título de la nota 19/10/2021

Cuadro 1. Predicciones de variables de estado

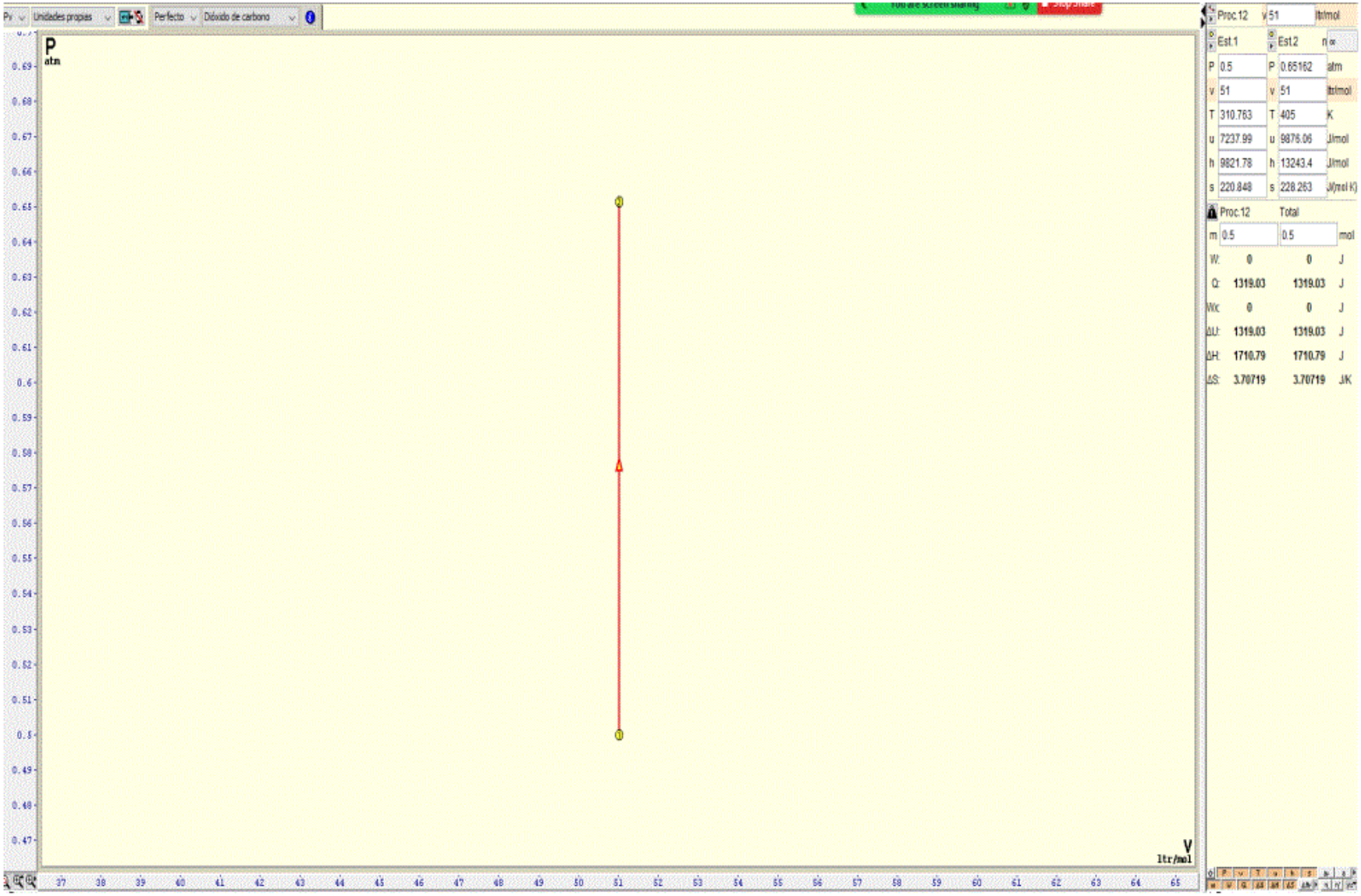
Variables de estado	
Proceso de las variables	**Predicción**
$n_1 \rightarrow n_2$	constante por ser un sistema cerrado
$V_1 \rightarrow V_2$	constante por ser un proceso isocórico
$T_1 \rightarrow T_2$	$T_2 > T_1$ porque se trata de un calentamiento
$p_1 \rightarrow p_2$	$p_2 > p_1$ porque se trata de un calentamiento

Cuadro 2: Predicciones de funciones de estado

Funciones de estado	
ΔH	+
ΔU	+
ΔS	+
ΔH>ΔU	


Pv
Unidades propias
Perfecto
Dióxido de carbono
P
atm
ISOCORA
ISOBARA 2
ISOTERMA 2
ISOTERMA 1
ISOBARA 1
V
ltr/mol
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62
P: 0.41026 atm
v: 58.2197 ltr/mol
Zona: Gas
T: 291.081 K
s: 220.118 J/(mol-K)
Título: ---
u: 6687.03 J/mol
h: 9107.18 J/mol
af: -2205.56 J/mol
Proc.12 v 51.0329 ltr/mol
Est.1 Est.2 n ∞
P 0.5 P 0.651 atm
v 51.0329 v 51.0329 ltr/mol
T 310.964 T 404.873 K
u 7243.61 u 9872.55 J/mol
h 9829.07 h 13238.8 J/mol
s 220.872 s 228.259 J/(mol-K)
Proc.12 Total
m 1 1 mol
W: 0 0 J
Q: 2628.94 2628.94 J
Wx: 0 0 J
ΔU: 2628.94 2628.94 J
ΔH: 3409.74 3409.74 J
ΔS: 7.38764 7.38764 J/K
1/1
Sin título

	modelo perfecto
ΔH (J)	3409.74/2= 1704.87
ΔU (J)	2628.94/2= 1314.47
ΔS(J/K)	7.38764/2= 3.69382
w (J)	0
q (J)	2628.94/2= 1314.47


Unidades propias
Perfecto
Dióxido de carbono
P
atm
V
ltr/mol
Proc.12
Est.1
Est.2
Total
mol
J
J/K

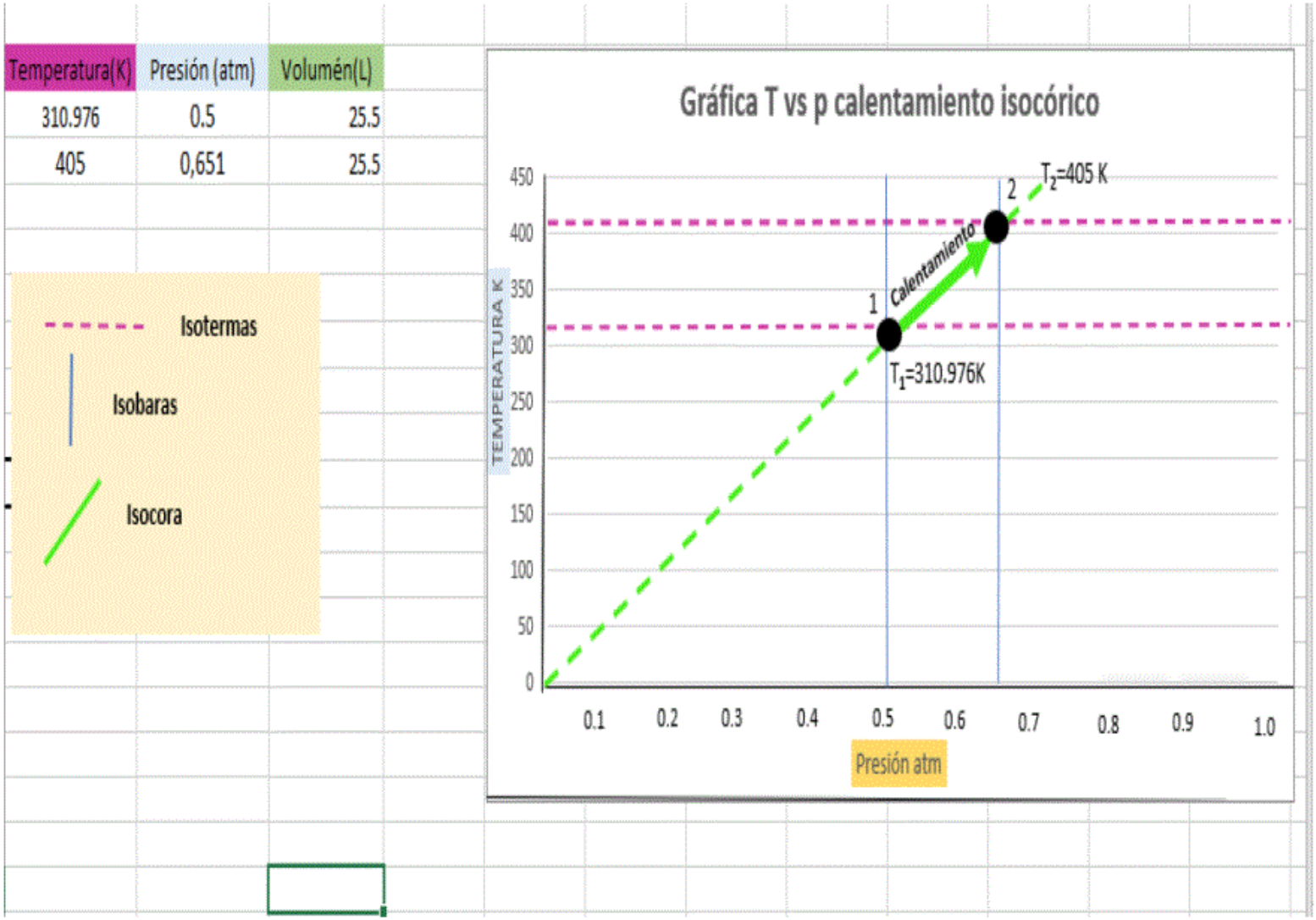


Figura 15. Gráfica temperatura vs presión

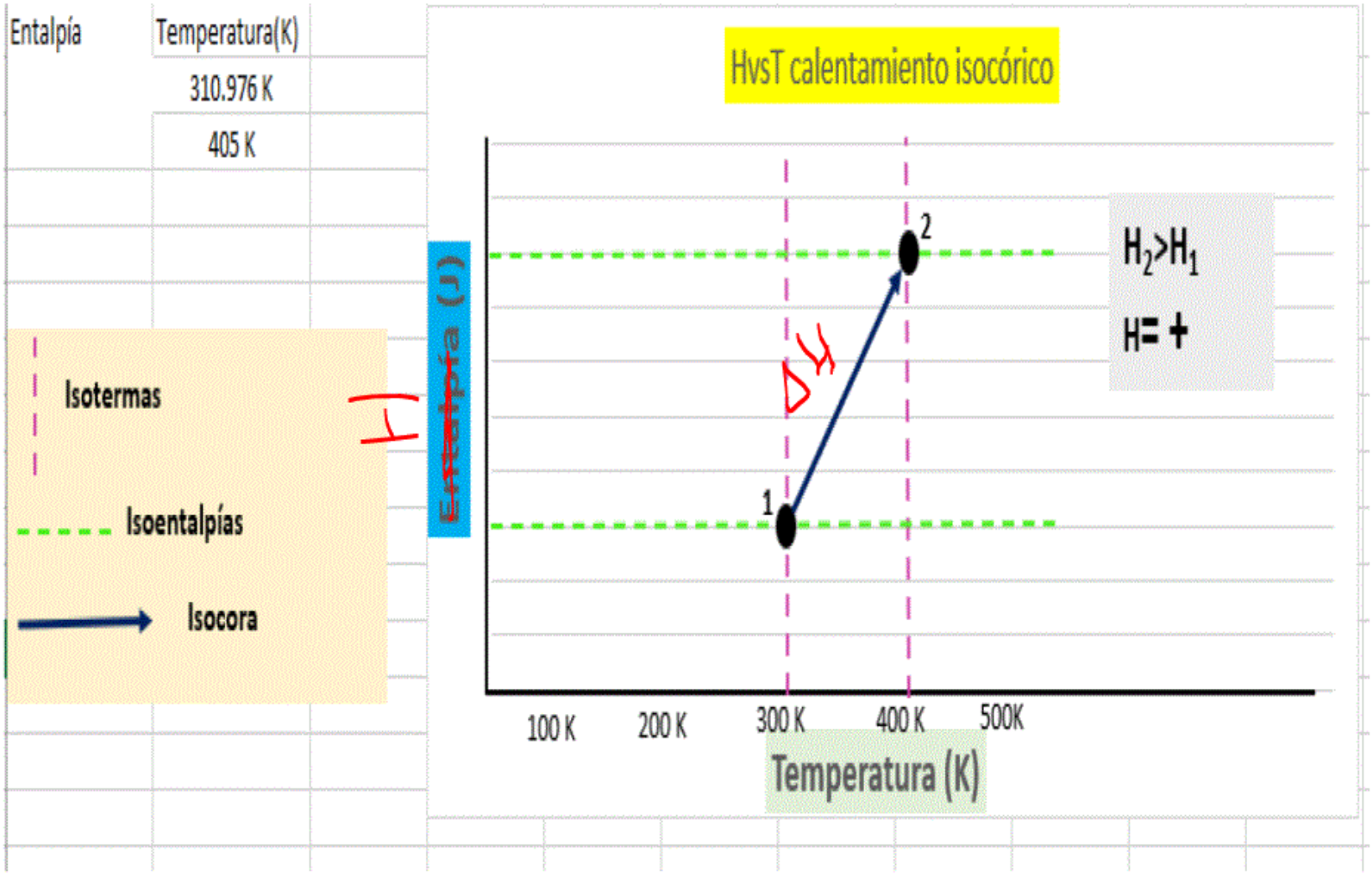
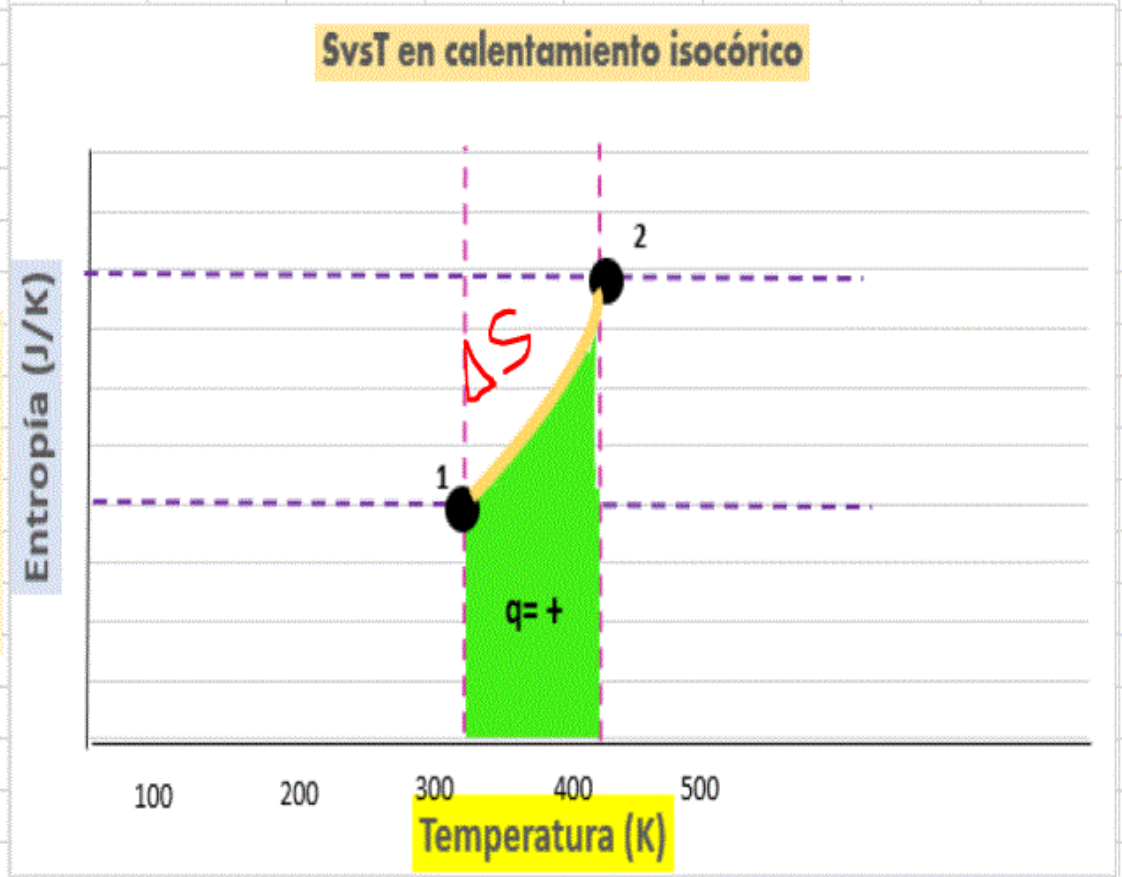


Figura 16. Gráfica entalpía vs temperatura

- **S vs T**

Entropía	Temperatura(K)
	310.976
	405



Proceso adiabático

$q = 0$

aislado

- R
  - exp.
  - comp.
- IR
  - exp.
  - comp.

7 Isolíneas

2 isot.
2 isob.
2 isoc.
1 adiabata

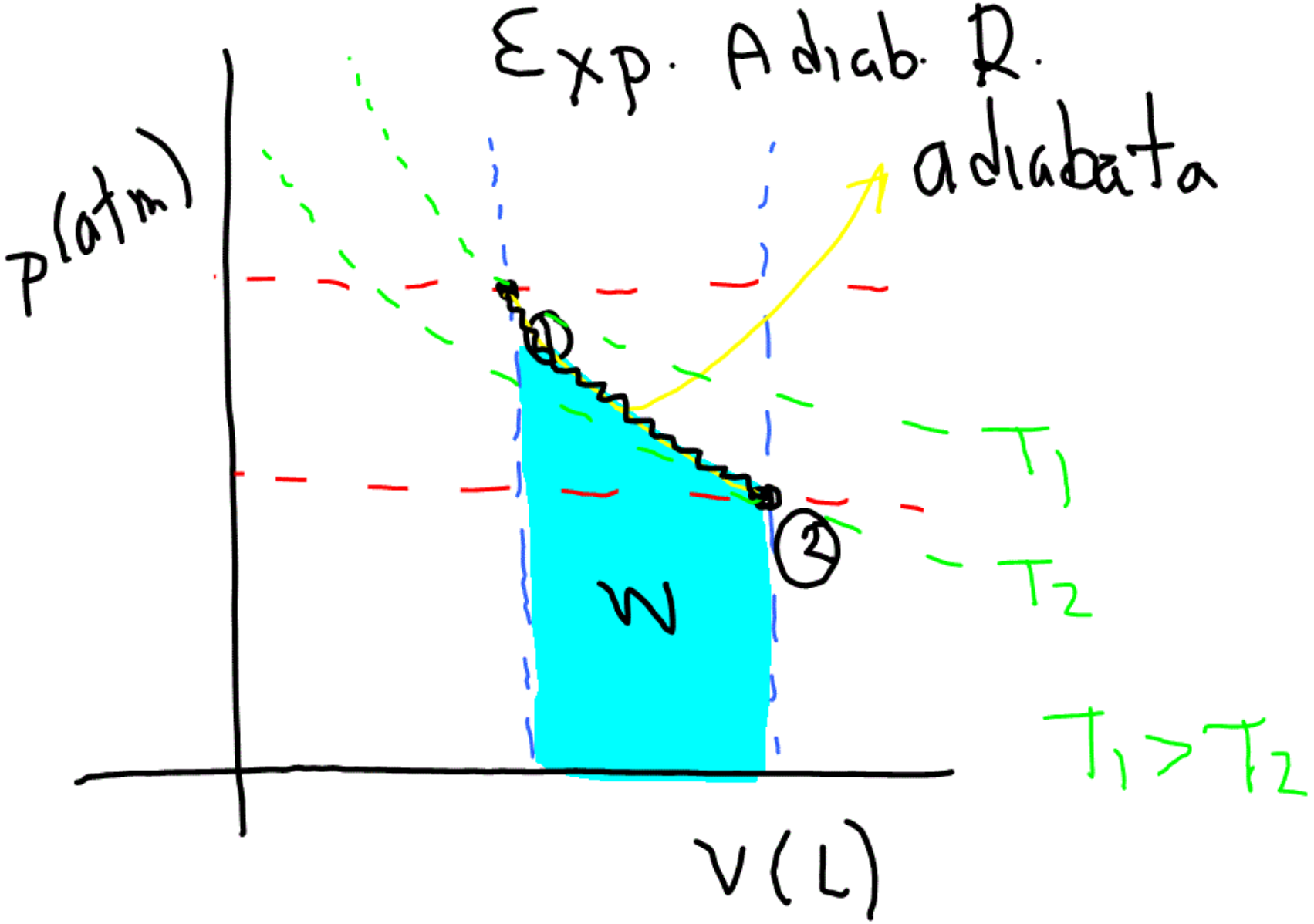
sistema aislado { no cambia energía ni materia

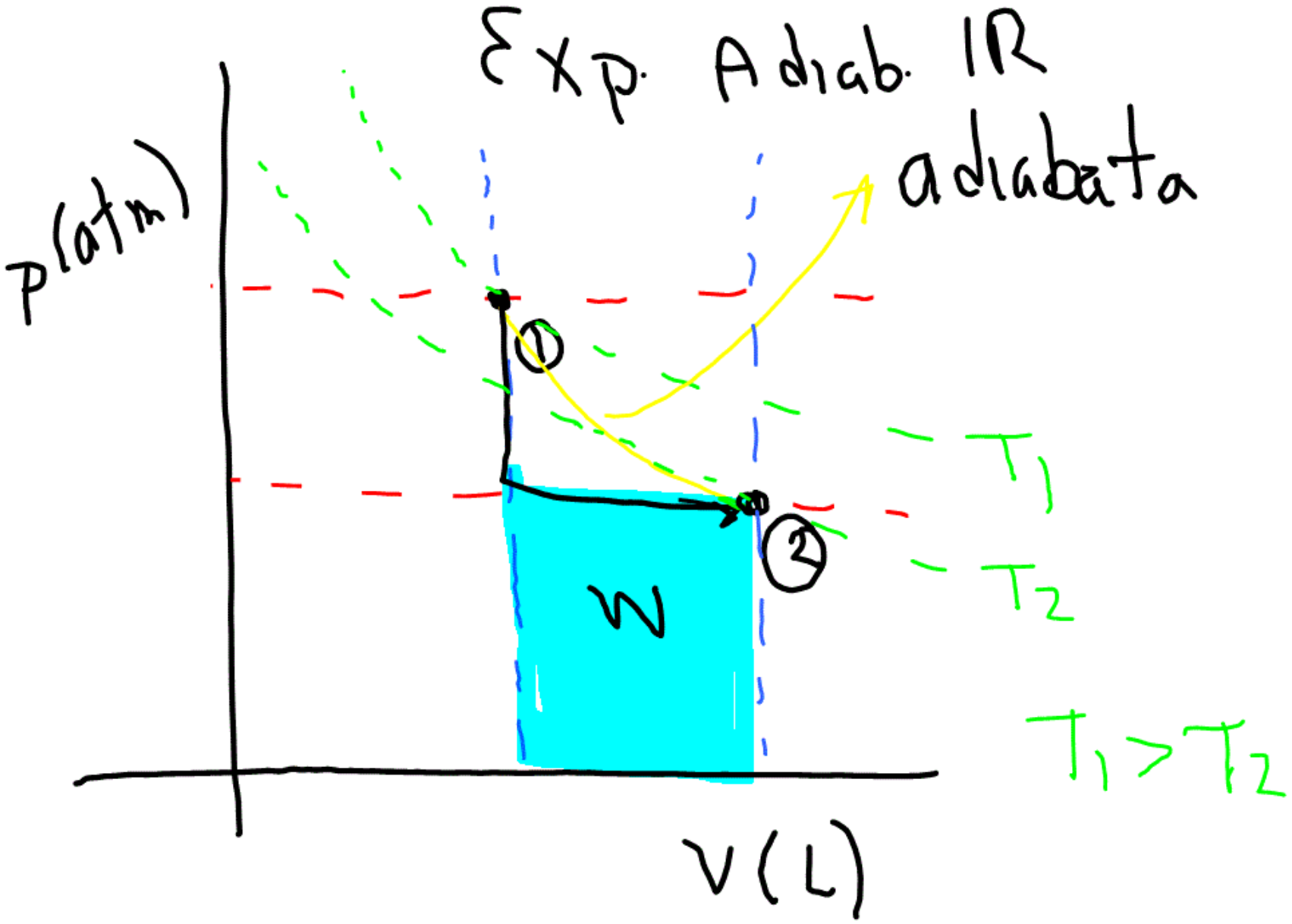
↓

micro { q

$\Delta S = 0$ R { exp. comp.

$\Delta S > 0$ IR { exp. comp.


Exp. Adiab. R.
adiabata
p(atm)
1
2
W
T_1
T_2
$T_1 > T_2$
V(L)


Exp. Adiab. IR
adiabata
p(atm)
1
2
W
T1
T2
T1 > T2
V(L)

$$pV^{x} = cte$$

$x = 0$ Isobárico

$x = 1$ Isotérmico

$x = \gamma$ $x = \infty$ Isocórico

Adiabático $x \neq 0, 1, \infty$ adiabático

γ = coef. Isentrópico

$$\gamma = \frac{\overline{C_p}}{\overline{C_v}}$$

$\gamma \rightarrow 1 \rightarrow$ Isotérmico

Proceso R (g)

$q = 0$

$\Delta U = -W$

$dU = -\delta W$

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

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

$n\bar{C}_v dT = -nRT\frac{dV}{V}$

$$n\bar{C}_v \frac{dT}{T} = -nR \frac{dv}{v}$$

$$\bar{C}_p - \bar{C}_v = R$$

$$\bar{C}_v \frac{dT}{T} = -\left(\bar{C}_p - \bar{C}_v\right) \frac{dv}{v}$$

$$\frac{dT}{T} = -\left(\frac{\bar{C}_p - \bar{C}_v}{\bar{C}_v}\right) \frac{dv}{v}$$

$$\int_{T_1}^{T_2} \frac{dT}{T} = -(\gamma - 1) \int_{V_1}^{V_2} \frac{dV}{V}$$

$$\ln \frac{T_2}{T_1} = -(\gamma - 1) \ln \frac{V_2}{V_1}$$

$$\ln \frac{T_2}{T_1} = (\gamma - 1) \ln \frac{V_1}{V_2}$$

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

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

$$\boxed{\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{X-1}}$$

$X = \gamma$

adiabático

$$X = 0$$

$$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{0-1}$$

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

Isobárico

$$\boxed{\frac{T_2}{T_1} = \frac{V_2}{V_1}}$$

$$T_2 = \frac{T_1 V_2}{V_1}$$

$$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{X-1}$$

$X = 1$

Isot.

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

$$\frac{T_2}{T_1} = 1$$

$$T_2 = T_1$$

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

$$V = \frac{nRT}{P}$$

$$\frac{T_2}{T_1} = \left(\frac{n_1 R T_1 / p_1}{n_2 R T_2 / p_2}\right)^{\gamma-1}$$

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

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

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

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

$$\left(\frac{T_2}{T_1}\right)^{\frac{\gamma}{\gamma}} = \left(\frac{P_2}{P_1}\right)^{\frac{\gamma-1}{\gamma}}$$

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{\frac{\gamma-1}{\gamma}}$$

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{1-\frac{1}{\gamma}}$$

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{\frac{X-1}{X}}$$

Isotérmico

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{1-\frac{1}{X}} \qquad X = 1$$

$$\frac{T_2}{T_1} = \left(\frac{P_2}{P_1}\right)^{1-\frac{1}{1}}$$

$$T_2 = T_1$$

$$\frac{T_2}{T_1} = \left(\frac{V_1}{V_2}\right)^{\gamma-1} \qquad T = \frac{pV}{nR}$$

$$\frac{p_2V_2/nR}{p_1V_1/nR} = \left(\frac{V_1}{V_2}\right)^{\gamma-1}$$

$$\frac{p_2V_2}{p_1V_1} = \left(\frac{V_1}{V_2}\right)^{\gamma-1}$$

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

$$\frac{P_2}{P_1} = \left(\frac{V_1}{V_2}\right)^{\gamma}$$

$$P_2 V_2^{\gamma} = P_1 V_1^{\gamma}$$

$$P_2 V_2^{X} = P_1 V_1^{X} \qquad X = 0$$

$$P_2 V_2^{0} = P_1 V_1^{0} = P_2 = P_1$$

Isobárico