Clase 17 12 octubre 2020

Título de la nota 10/10/2020

Calculando V_1		proceso	Calculando V_2		
p_1 (atm)	0.820	→	p_2 (atm)	0.410	expansión
V_1 (L)	60.000	→	V_2 (L)	120.000	
T_1 (K)	400.000	→	T_2 (K)	400.000	
n_1 (mol)	1.500	→	n_2 (mol)	1.500	
	R (J/molK)	8.314			
			presión	disminuye	
		expansión			
			Volumen	aumenta	

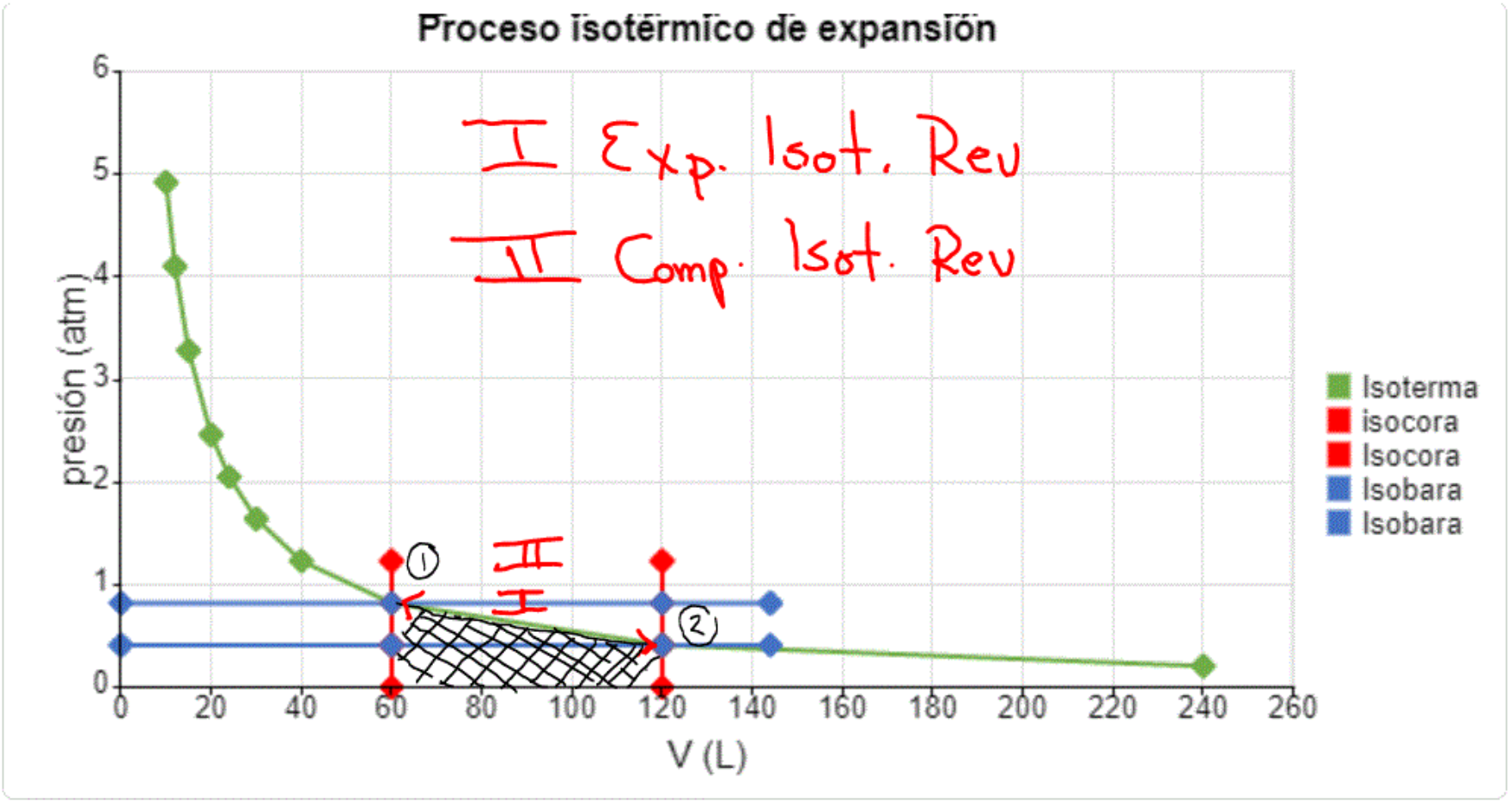
Reversible	
ΔH (J)	0
ΔU (J)	0
ΔS_{Rev} (J/K)	8.644
q_{Rev} (J)	3457.695
w_{Rev} (J)	3457.695

Irreversible	
ΔH (J)	0
ΔU (J)	0
ΔS_{Irrev} (J/K)	6.231
q_{Irrev} (J)	2492.595
w_{Irrev} (J)	2492.595

$q_{Rev} > q_{Irrev}$

$w_{Rev} > w_{Irrev}$

$\Delta S_{Rev} > \Delta S_{Irrev}$


Proceso isotérmico de expansión
I Exp. Isot. Rev
II Comp. Isot. Rev
presión (atm)
V (L)
0
1
2
3
4
5
6
0
20
40
60
80
100
120
140
160
180
200
220
240
260
Isoterma
isocora
Isocora
Isobara
Isobara
1
2
II
I

Calculando V_1		proceso	Calculando V_2		
p_1 (atm)	0.410	→	p_2 (atm)	0.820	compresión
V_1 (L)	120.000	→	V_2 (L)	60.000	
T_1 (K)	400.000	→	T_2 (K)	400.000	
n_1 (mol)	1.500	→	n_2 (mol)	1.500	
	R (J/molK)	8.314			
			presión	aumenta	
		compresión			
			Volumen	disminuye	

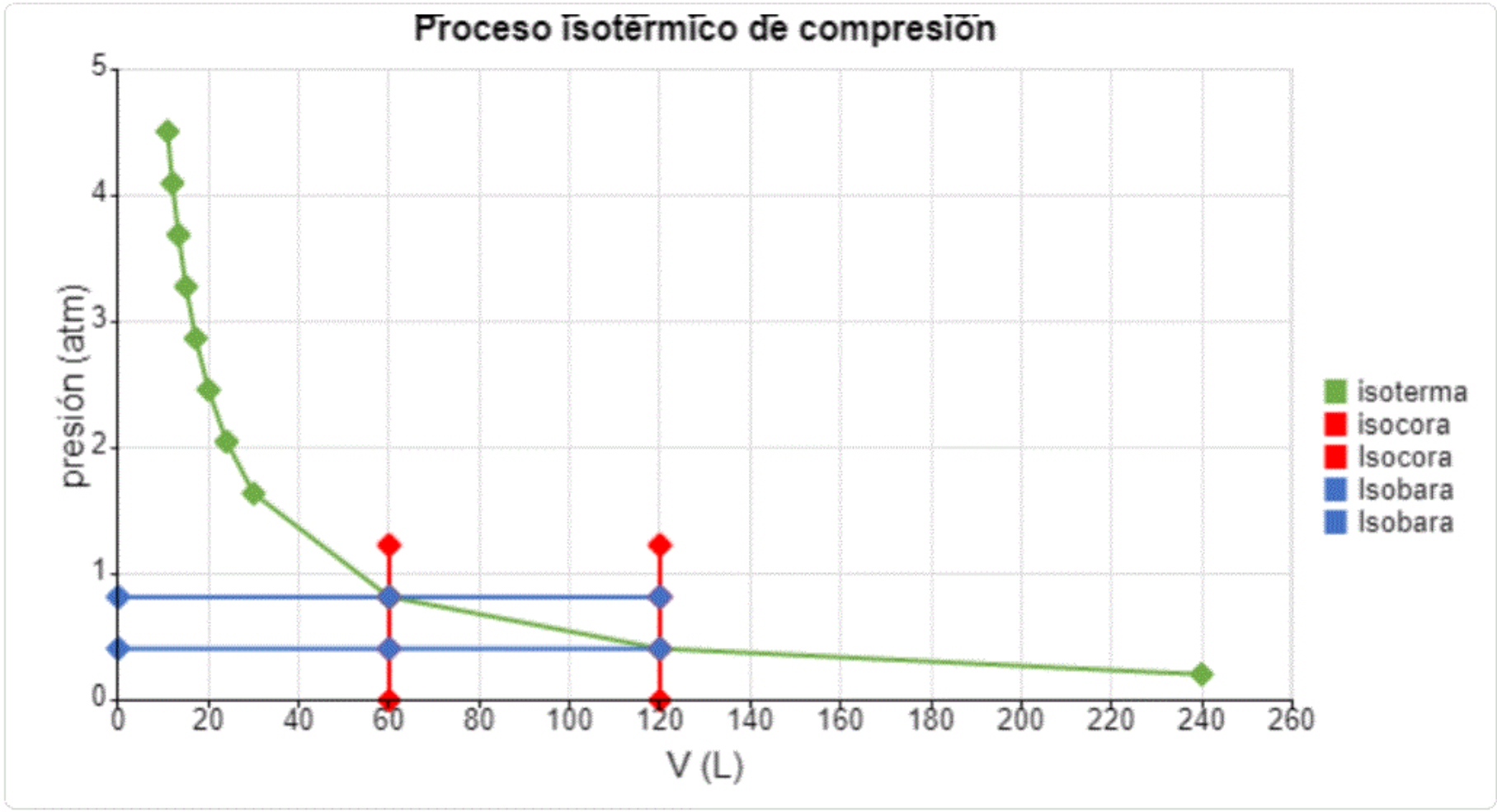
Reversible	
ΔH (J)	0
ΔU (J)	0
ΔS_{Rev} (J/K)	-8.644
q_{Rev} (J)	-3457.695
w_{Rev} (J)	-3457.695

Irreversible	
ΔH (J)	0
ΔU (J)	0
ΔS_{Irrev} (J/K)	-12.463
q_{Irrev} (J)	-4985.190
w_{Irrev} (J)	-4985.190

$q_{Rev} < q_{Irrev}$

$w_{Rev} < w_{Irrev}$

$\Delta S_{Rev} < \Delta S_{Irrev}$


Proceso isotérmico de compresión
presión (atm)
V (L)
0
1
2
3
4
5
0
20
40
60
80
100
120
140
160
180
200
220
240
260
isoterma
isocora
Isocora
Isobara
Isobara

Ciclo 1

I Exp. Isot. Rev

II Comp. Isot. Rev.

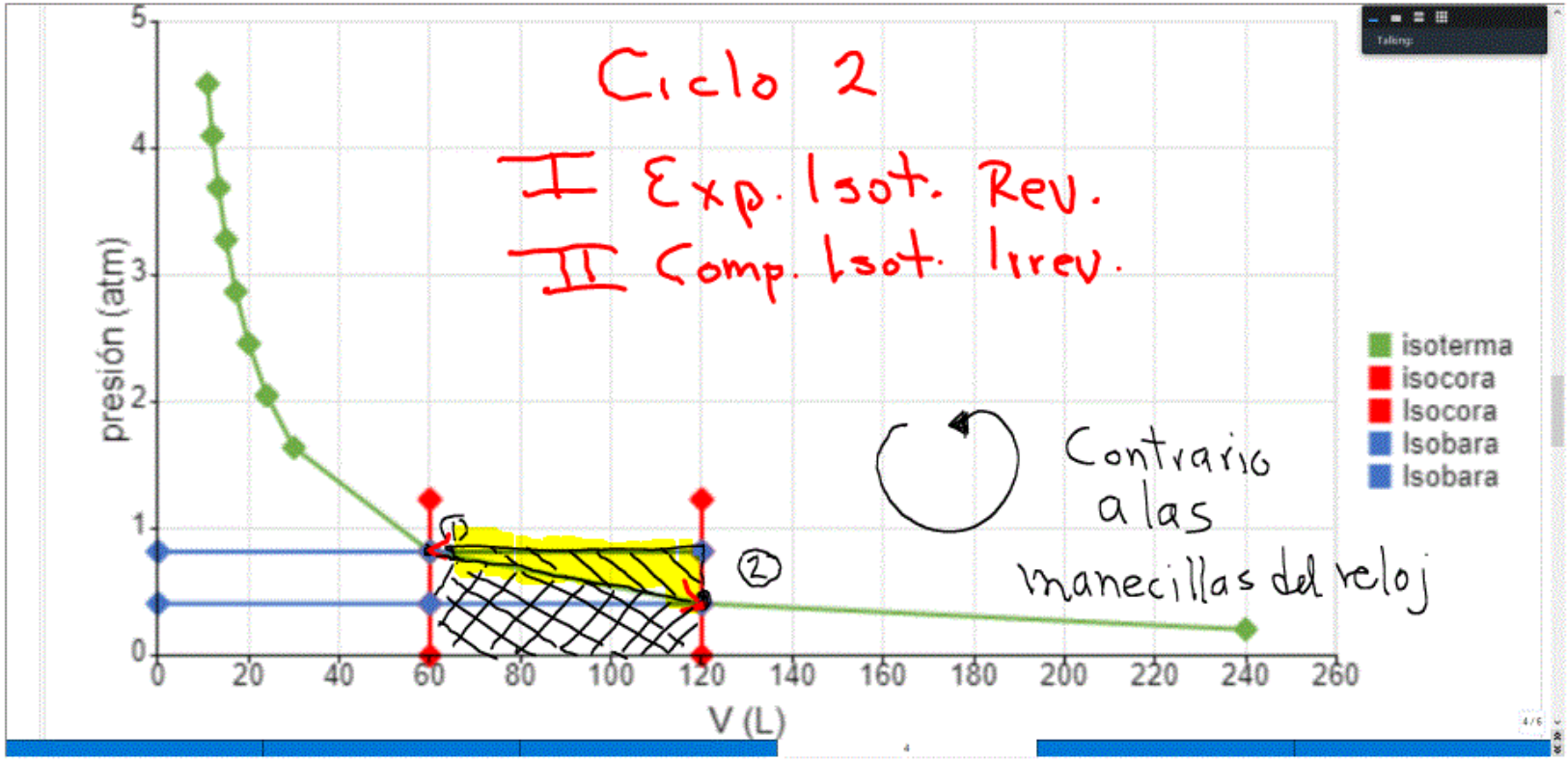
	ΔU(J)	ΔH(J)	ΔS (J/K)	q (J)	w (J)
I	0	0	8.644	3457.69	3457.69
II	0	0	− 8.644	−3457.69	−3457.69
total	0	0	0	0	0

Ciclo 2

I Exp. Isot. Rev

II Comp. Isot. Irrev.

	ΔU[J]	ΔH[J]	ΔS [J/K]	q[J]	w[J]
I	0	0	8.644	3457.69	3457.69
II	0	0	−12.46	−4985.19	−4985.19
total	0	0	−3.816	−1527.5	−1527.5

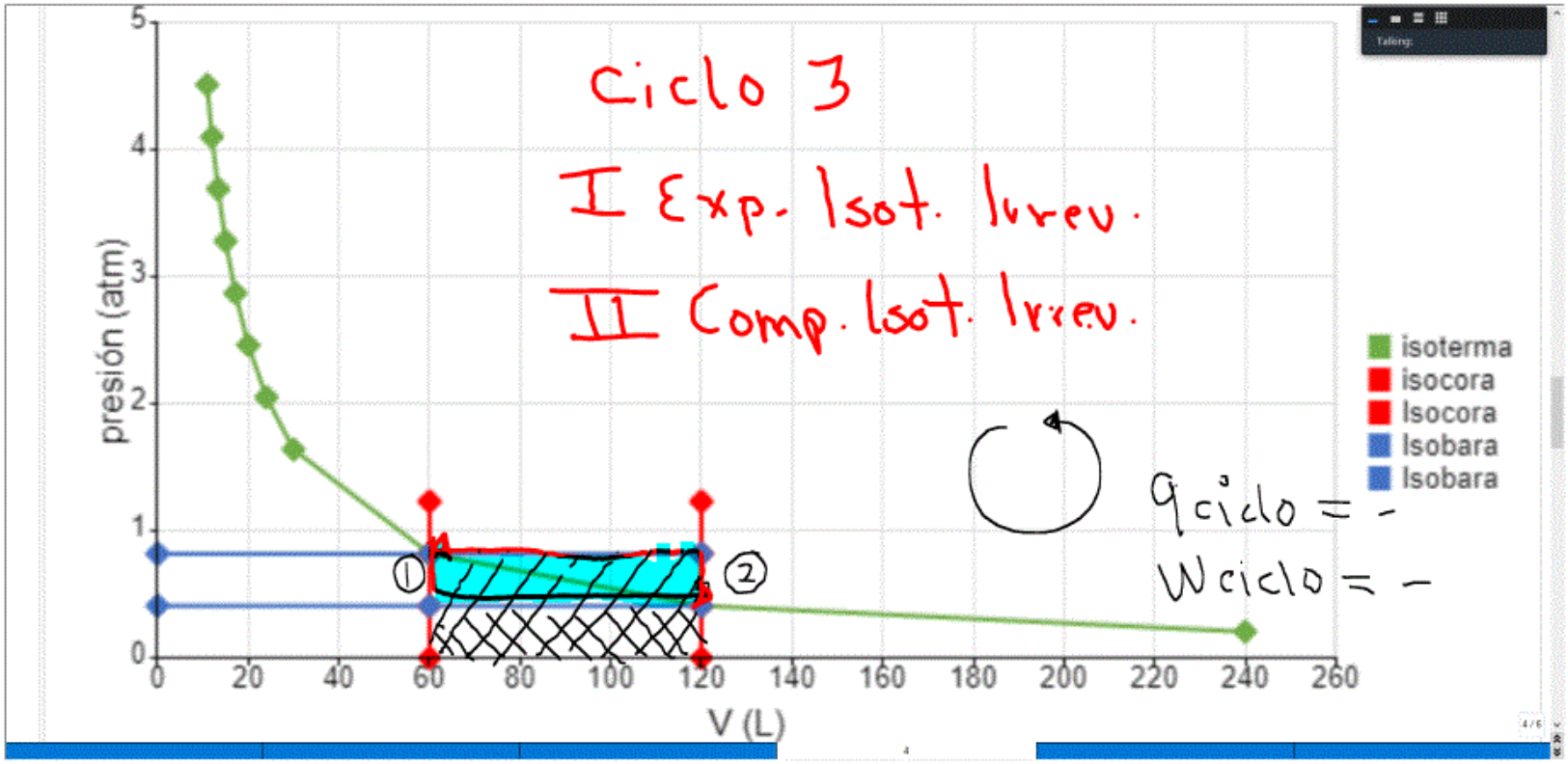

Ciclo 2
I Exp. Isot. Rev.
II Comp. Isot. Irrev.
presión (atm)
V (L)
0
1
2
3
4
5
0
20
40
60
80
100
120
140
160
180
200
220
240
260
isoterma
isocora
Isocora
Isobara
Isobara
Contrario a las manecillas del reloj
1
2

Ciclo 3

I Exp Isot. Irrev

II Comp. Isot. Irrev.

	ΔU[J]	ΔH[J]	ΔS (J/K)	q (J)	w (J)
I	0	0	6.28	2492.59	2492.59
II	0	0	−12.46	−4985.19	−4985.19
total	0	0	−6.18	−2492.59	−2492.59

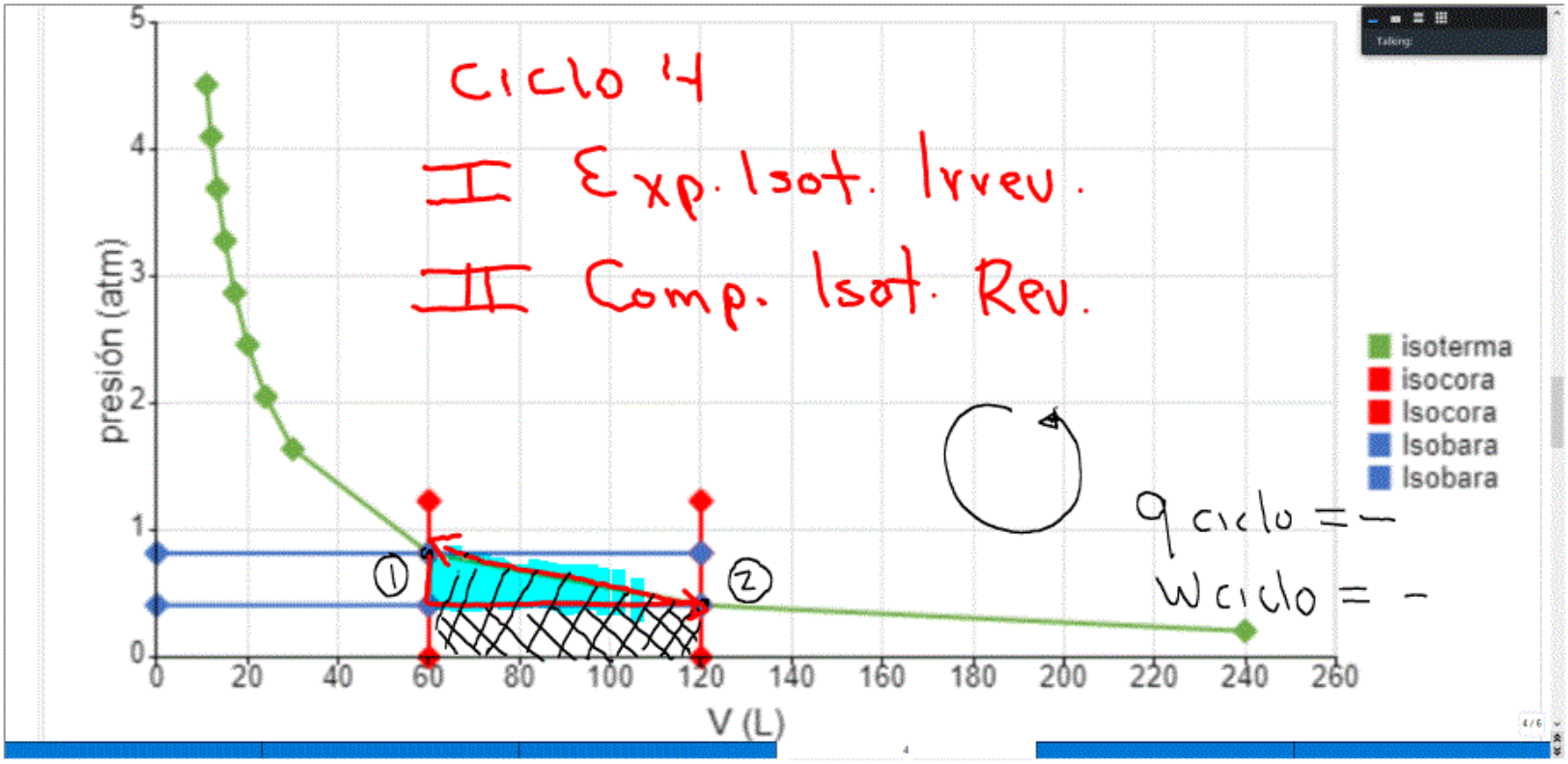

Ciclo 3
I Exp. Isot. Irrev.
II Comp. Isot. Irrev.
isoterma
isocora
Isocora
Isobara
Isobara
presión (atm)
V (L)
0
1
2
3
4
5
0
20
40
60
80
100
120
140
160
180
200
220
240
260
①
②
qciclo = -
Wciclo = -

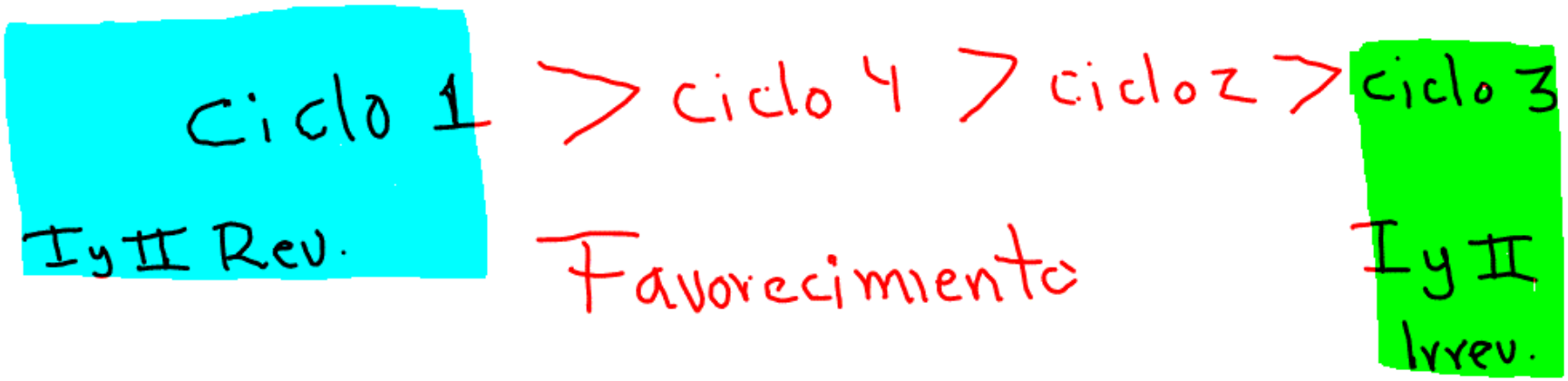
Ciclo 4

I Exp Isot. Irrev

II Comp. Isot. Rev.

	ΔU[J]	ΔH(J)	Δs (J/K)	q(J)	w(J)
I	0	0	6.28	2492.59	2492.59
II	0	0	−8.644	−3457.64	−3457.64
total	0	0	−2.364	−965.8	−965.8


Ciclo 4
I Exp. Isot. Irrev.
II Comp. Isot. Rev.
presión (atm)
V (L)
isoterma
isocora
Isocora
Isobara
Isobara
q ciclo = -
W ciclo = -
1
2


Ciclo 1
I y II Rev.
> ciclo 4 > ciclo 2 >
Favorecimiento
ciclo 3
I y II
Irrev.

Proceso Isobárico $p = cte$

$p_1 \rightarrow p_2 = cte$

$n_1 \rightarrow n_2 = cte$ sist. cerrado

$V_1 \rightarrow V_2$ { $V_2 > V_1$ $V_1 > V_2$

$T_1 \rightarrow T_2$ { $T_2 > T_1$ $T_1 > T_2$

expansión compresión

$$q_p = \Delta H = n \bar{C}_p \Delta T$$

$$\int dq = \int_1^2 dH = n \bar{C}_p \int_1^2 dT$$

extensivo $q = \Delta H = n \bar{C}_p (T_2 - T_1)$

intensivo $\bar{q} = \overline{\Delta H} = \bar{C}_p (T_2 - T_1)$

$$\Delta U = n \bar{C}_v \Delta T$$

extensivo

$$dU = n \bar{C}_v \, dT$$

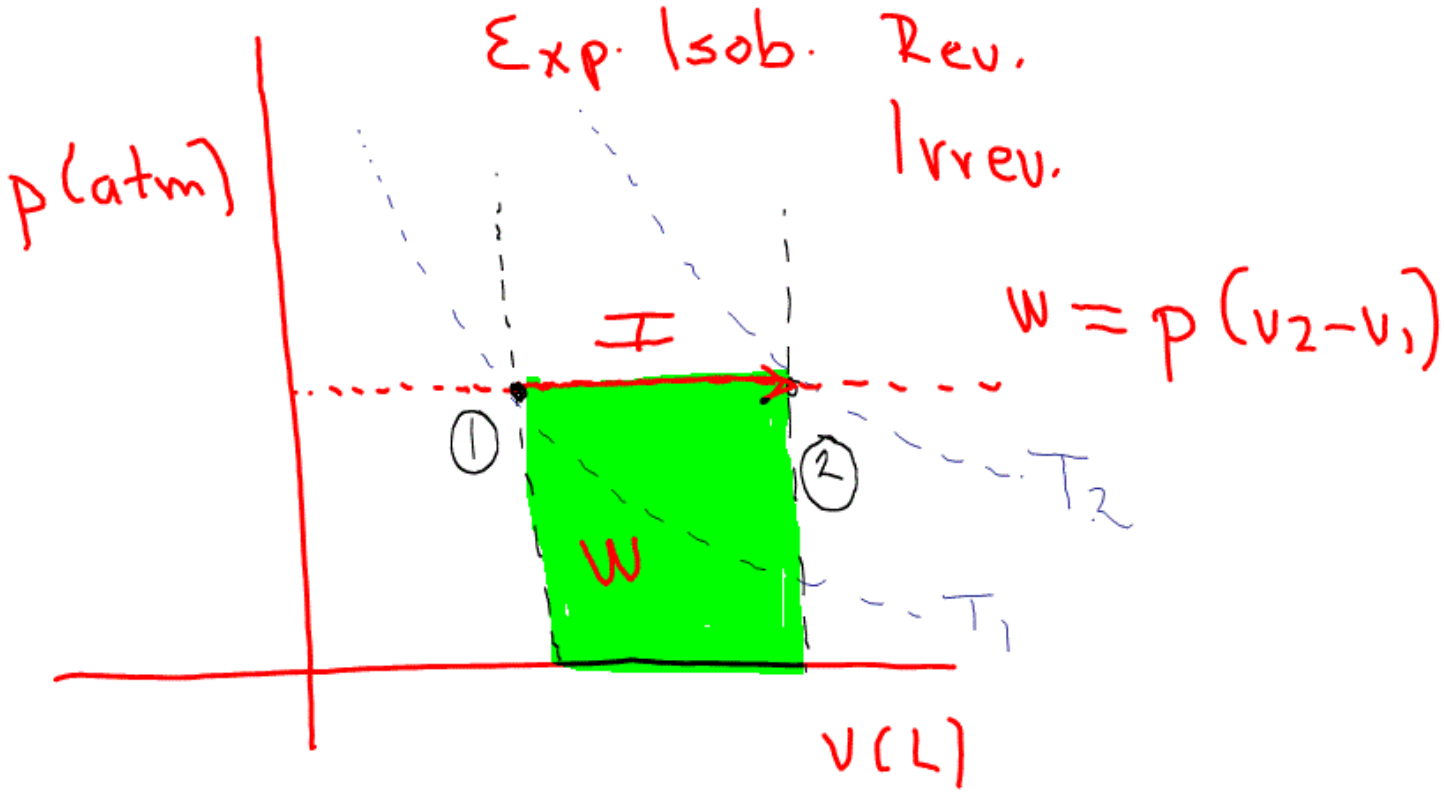
$$\bar{\Delta U} = \bar{C}_v \, \Delta T$$

intensivo

$$d\bar{U} = \bar{C}_v \, dT$$

$$ds = \frac{\delta q}{T} = \frac{n \bar{C}_p \, dT}{T}$$

$$\int_1^2 ds = n \bar{C}_p \int_{T_1}^{T_2} \frac{dT}{T} = \Delta S = n \bar{C}_p \ln \frac{T_2}{T_1}$$


Exp. Isob. Rev.
Irrev.
p(atm)
I
W = p(V2-V1)
1
2
T2
W
T1
V(L)

$$p_1 = \frac{n_1 R T_1}{V_1} \qquad p_2 = \frac{n_2 R T_2}{V_2}$$

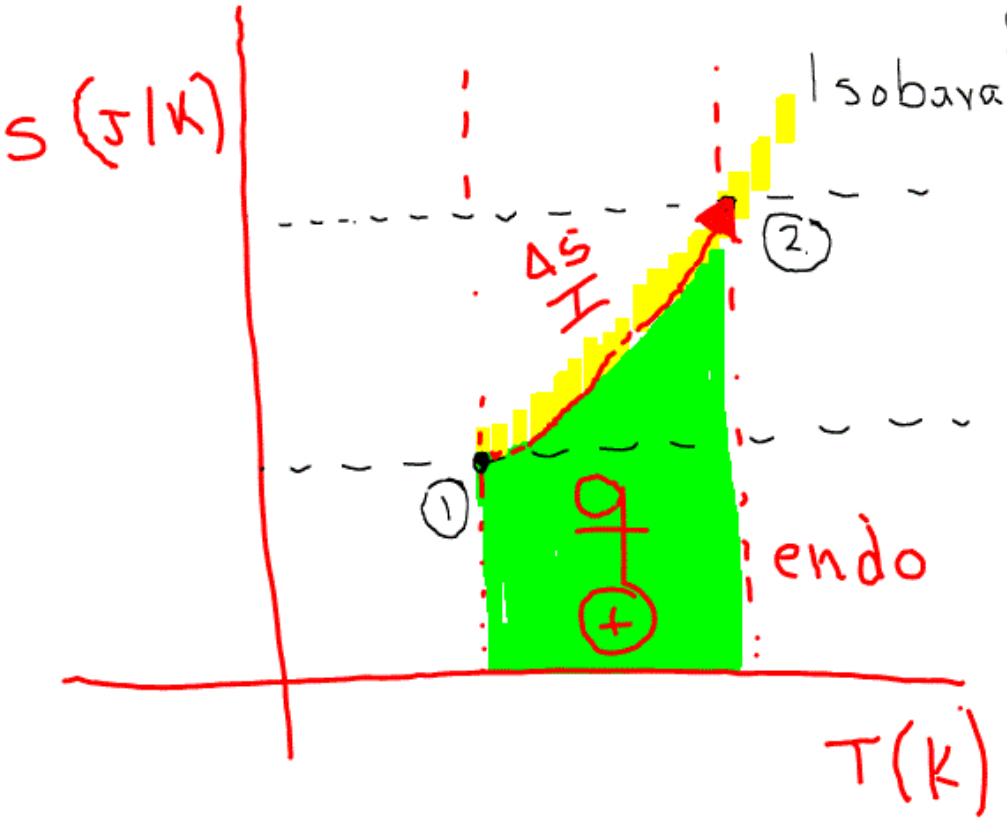
$$p_1 = p_2$$

$$\frac{n_1 R T_1}{V_1} = \frac{n_2 R T_2}{V_2}$$

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

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

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



$$\Delta S = n \bar{C}_p \ln \frac{T_2}{T_1}$$