Clase 16 20 septiembre 2021

Título de la nota 20/09/2021

Entropía

2da

Ley

Termodinámica

- S $\frac{cal}{K}$ ó $\frac{J}{K}$ — UES (extensivas)
- $\bar{S}$ $\frac{cal}{molK}$ ó $\frac{J}{molK}$ (intensivas)

Entropía

- probabilidad de choque molecular
- Desorden
- $\Delta S_U = \Delta S_{sis} + \Delta S_{Alr}$
- $\Delta S_U > 0$ Función estado
- $dS \geq 0$
- $\boxed{dS = \frac{dq}{T}}$

Entropía

$$\Delta S = S_2 - S_1$$

Tablas

S Absoluta

(Calcular)

$S_1 = 0\ K = 0$

Cristal perfecto

3ra Ley Termodinámica

Lewis-Randall

Proceso Isotérmico

Sistema cerrado

$n_1 \longrightarrow h_2 = cte$

$T_1 \longrightarrow T_2 = cte$

$p_1 \rightarrow p_2$ { $p_2 > p_1$ compresión ; $p_2 < p_1$ expansión

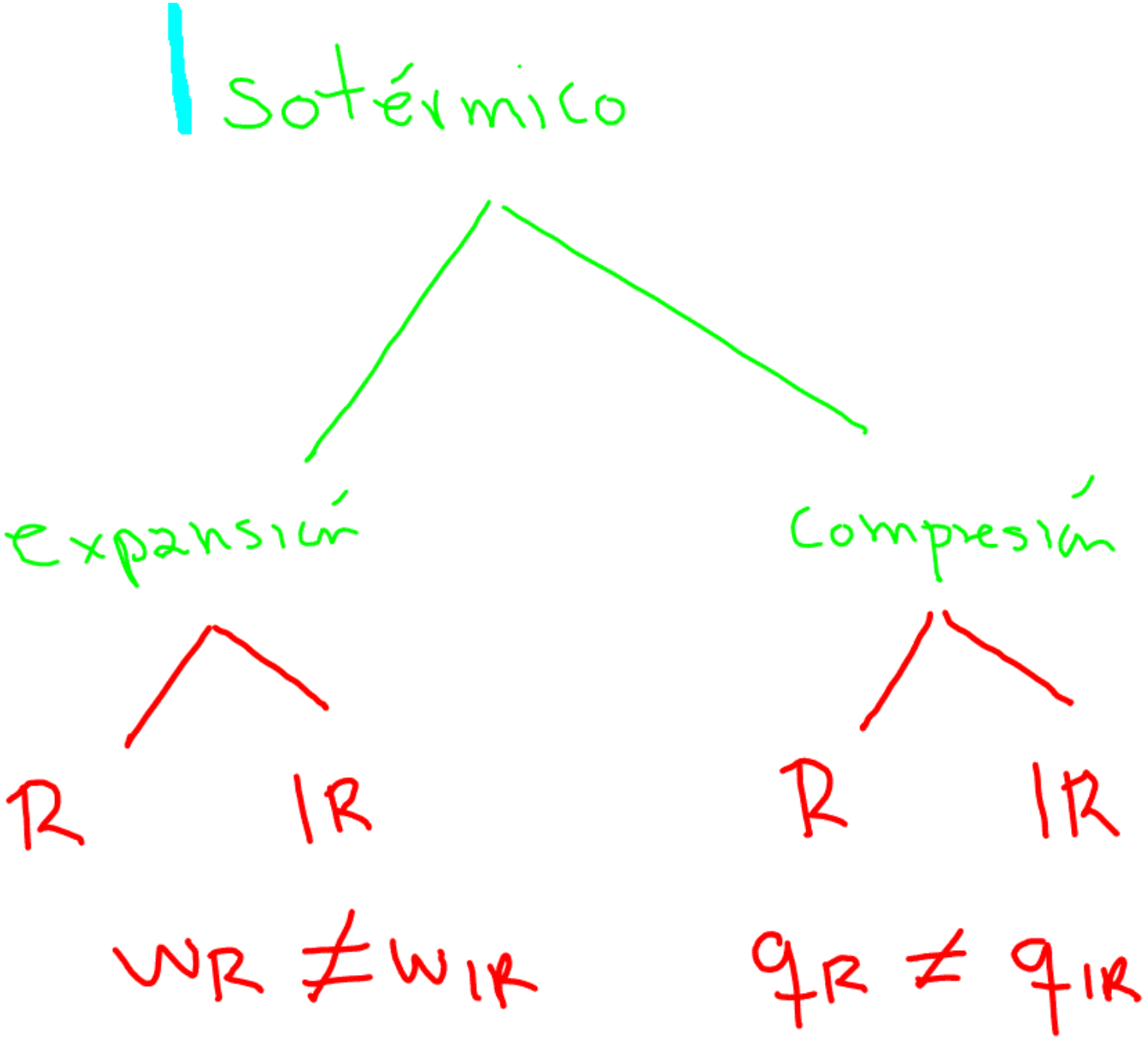
$V_1 \longrightarrow V_2$ { $V_2 > V_1$ expansión ; $V_2 < V_1$ compresión

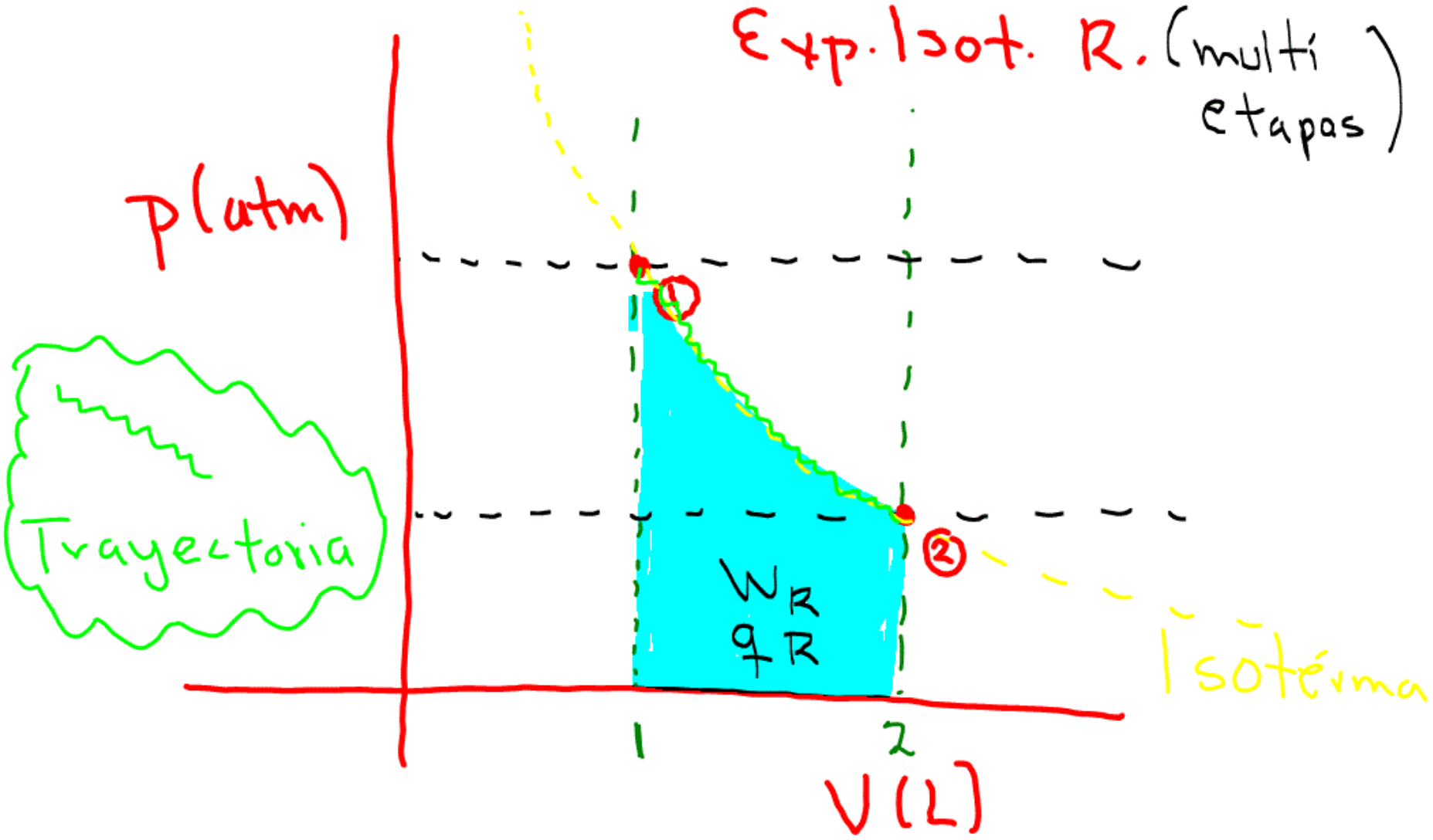
$$T_1 = \frac{p_1 V_1}{nR} \qquad T_2 = \frac{p_2 V_2}{nR}$$

$$T_1 = T_2$$

$$p_1 V_1 = p_2 V_2$$

$$p_2 = \frac{p_1 V_1}{V_2} \qquad V_2 = \frac{p_1 V_1}{p_2}$$

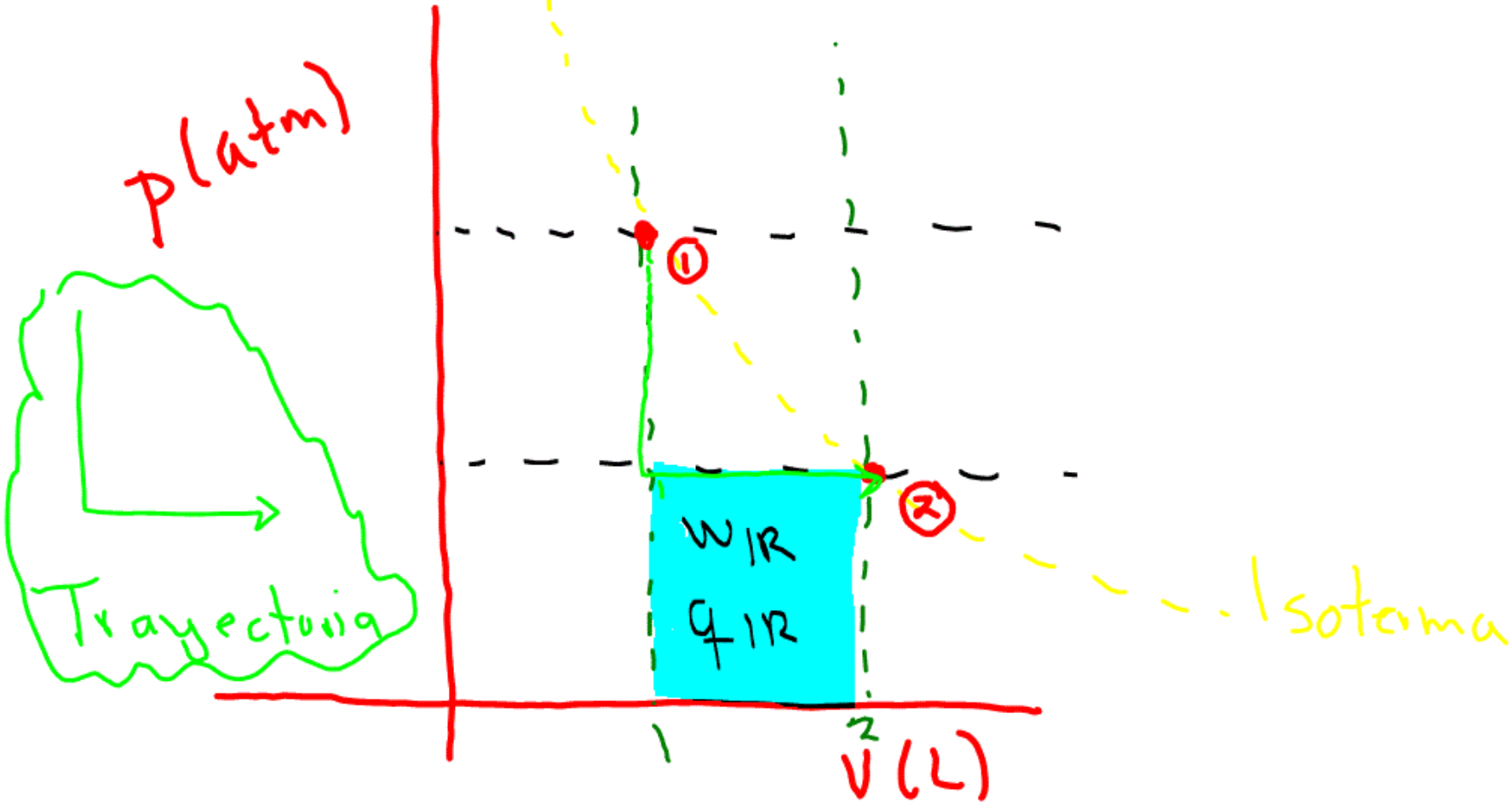

Isotérmico
Expansión
Compresión
R
IR
R
IR
$w_R \neq w_{IR}$
$q_R \neq q_{IR}$



$$\Delta U = q - W = 0$$

$$q = W \qquad q_R = W_R$$

Exp. Isot. IR. (1 etapa)



Exp. Isot.

$$W_R > W_{IR}$$

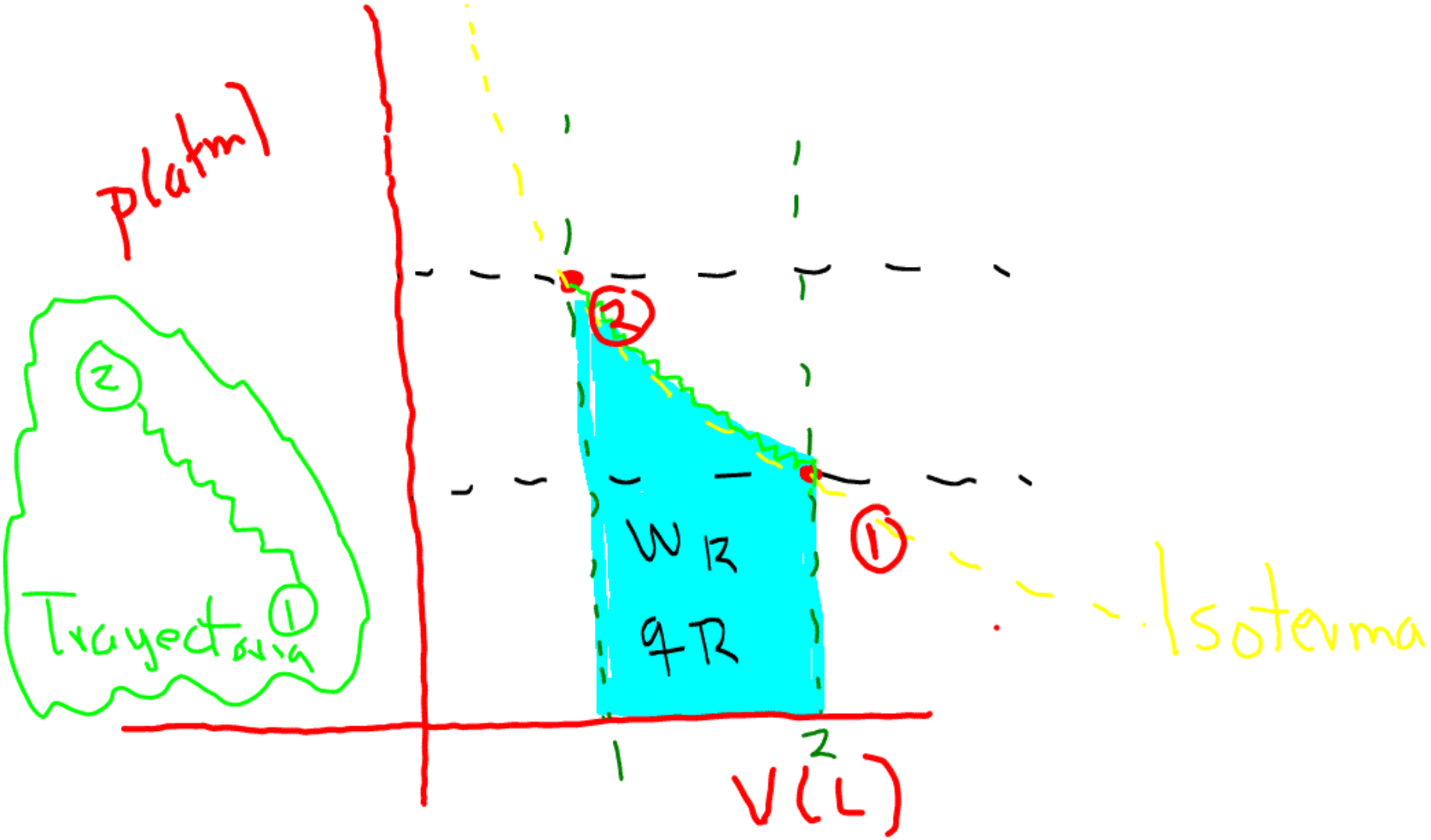
$$q_R > q_{IR}$$

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

$$\Delta H_R = \Delta H_{IR} = 0$$

$$\Delta U_R = \Delta U_R = 0$$

Comp. Isot. R. (multietapas)



Reversible (R)

Exp. $W_R = +$

Comp. $W_R = -$

Exp $q_R = +$ Endo

Comp $q_R = -$ Exo

$$\Delta U = q - w$$

Irreversible (IR)

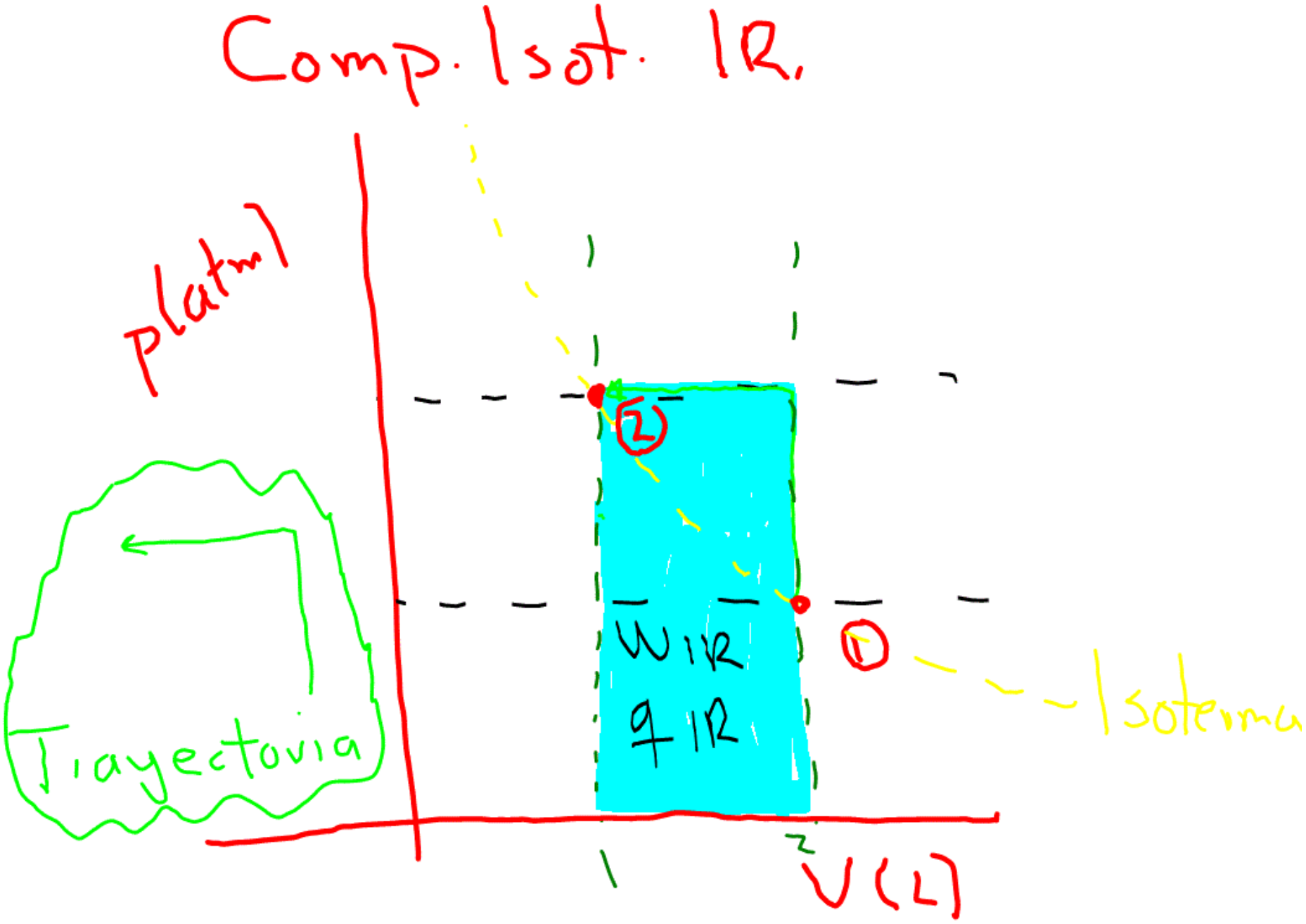
Exp. $w_R = +$

Comp. $w_R = -$

Exp $q_R = +$ Endo

Comp $q_R = -$ Exo

$$\Delta U = q - w$$


Comp. Isot. IR.
Patm
2
W IR
Q IR
1
Isoterma
Trayectoria
V (L)

R y IR

$W_R > W_{IR}$ exp.

$W_R < W_{IR}$ Comp.

$q_R > q_{IR}$ exp

$q_R < q_{IR}$ Comp.

Exp. Isot. R.

$\Delta H = 0 \quad \Delta U = 0$

$q_R = W_R$

$W = F \times d$

$dW = P\, dV \quad P = \frac{nRT}{V}$

$$\int_1^2 dw = \frac{nRT}{V}\int dV$$

$$W = nRT \int_{V_1}^{V_2} \frac{dV}{V}$$

$$W_R = nRT \left| \ln \frac{V_2}{V_1} \right.$$

$$W_R = nRT \ln \frac{V_2}{V_1}$$

$$= (\text{mol})\left(\frac{J}{\text{mol}\,K}\right)(K)$$

$$= J \text{ energía.}$$

$$W_R = q_R$$

$$W_R = nRT \ln \frac{V_2}{V_1} = q_R$$

$$W_R = nRT \ln \frac{p_1}{p_2} = q_R$$

$$dS_R = \frac{\partial q_R}{T}$$

$$\int_1^2 dS_R = \frac{nRT}{T} \ln \frac{V_2}{V_1}$$

$$\boxed{\Delta S_R = nR \ln \frac{V_2}{V_1}}$$

$$= \left(\cancel{mol}\right)\left(\frac{J}{\cancel{mol}\,K}\right)$$

$$= J/K \quad \text{UES} \quad \checkmark$$

$$\Delta S_R = nR \ln \frac{P_1}{P_2}$$

Exp. Isot.

$\Delta S_R = +$

Comp. Isot.

$\Delta S_R = -$