Clase 17 21 Septiembre 2021
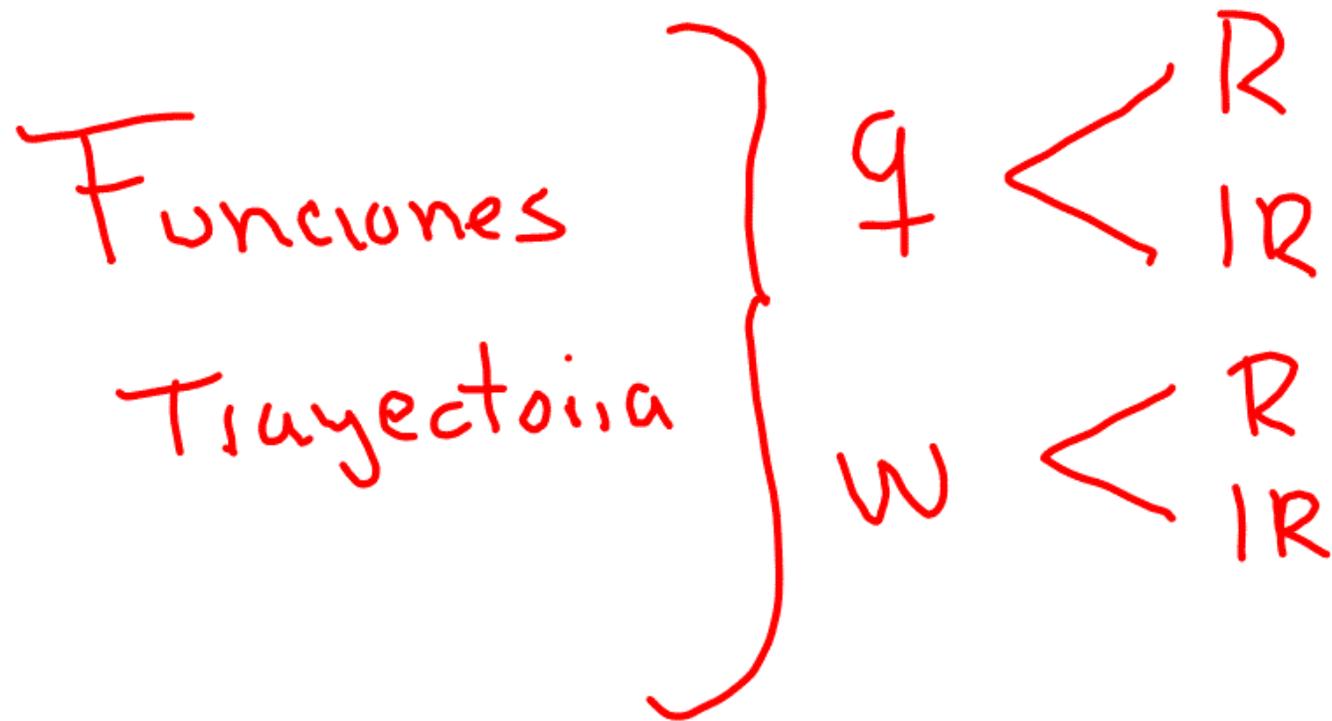
$$\Delta S = \boxed{S_2 - S_1}$$

Termograf

Isotérmico
Proceso
$$\left\{ \begin{array}{l} exp. \left\{ \begin{array}{l} R \\ IR \end{array} \right. \\ Comp. \left\{ \begin{array}{l} R \\ IR \end{array} \right. \end{array} \right.$$

$$\text{Funciones Trayectoria} \left\{ \begin{array}{l} q < {R \atop IR} \\[2em] w < {R \atop IR} \end{array} \right.$$

$$IR \rightarrow 1 \text{ solo pasos}$$

$$R \rightarrow \text{multipasos}$$

$$ds \geq \frac{dq}{T} \quad \text{desigualdad Clausius}$$

$$ds = 0 \quad \text{equilibrio}$$

$$\Delta S = \text{Función estado}$$
$$\hookrightarrow q = \text{Función trayectoria}$$

Isotérmico

$$\boxed{\Delta U} = \underbrace{q - W}$$
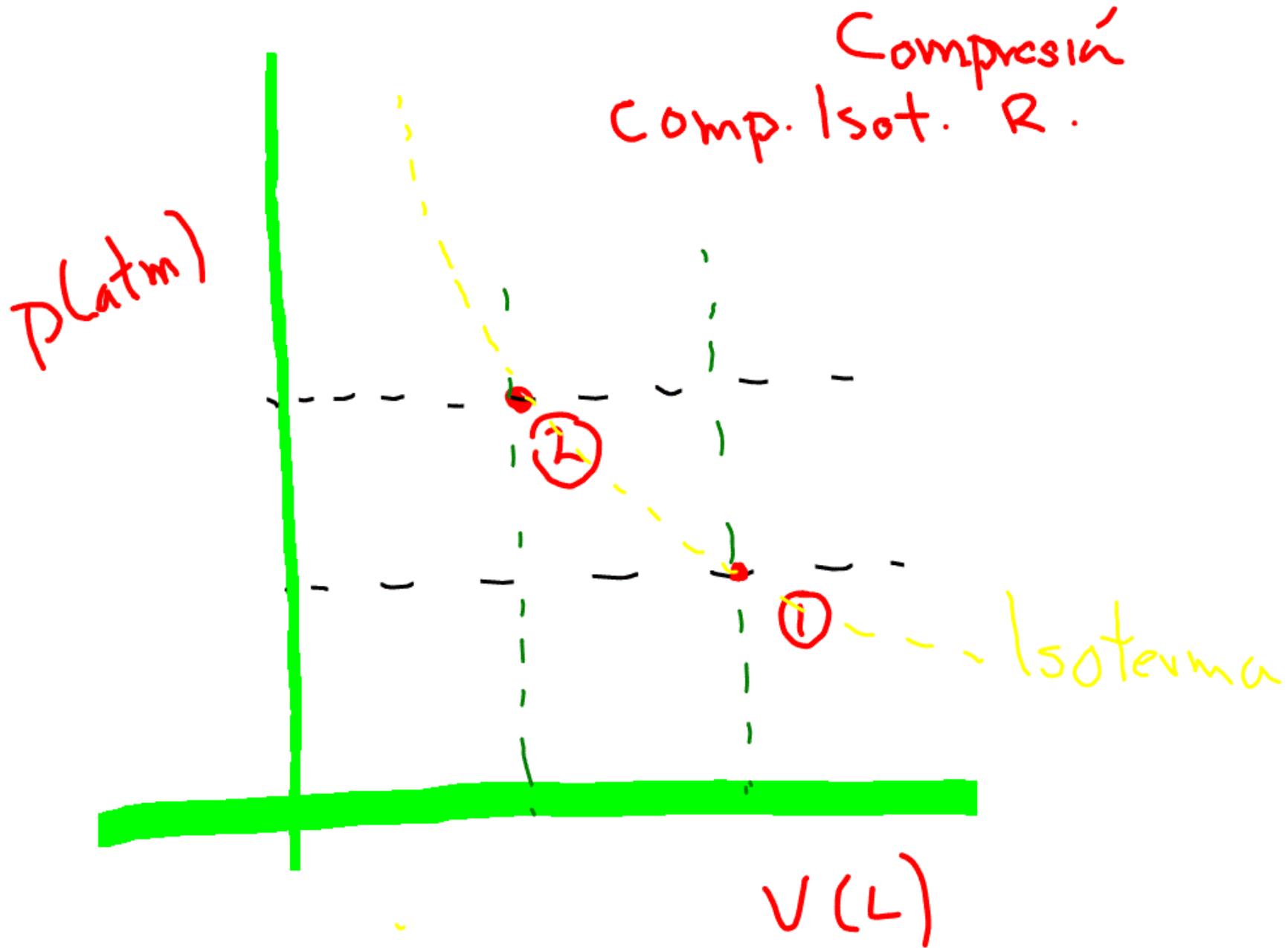
Función estado

Funciones Trayectoria

$$\Delta U = 0 = n\bar{C_v}\Delta T$$
$$\Delta T = 0 \qquad \Delta U = 0 \qquad \boxed{q = W}$$

Isotéimico

$h_1 \rightarrow h_2 \approx cte$ Sist. cerrado

$T_1 \rightarrow T_2 = cte$ Isotéimico

$V_1 \rightarrow V_2$ $V_2 > V_1$ exp.

              $V_2 < V_1$ comp.

$P_1 \rightarrow P_2$ $P_2 > P_1$ comp.

              $P_2 < P_1$ exp.

comp. Isot.

$$\Delta V = V_2 - V_1 = \; -$$

$$\Delta P = P_2 - P_1 = \; +$$

$$\Delta H = 0 \qquad \Delta U = 0$$

$$q = W \qquad \Delta S = \; -$$

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

$$n_1 = n_2 \simeq \text{cerrado}$$

$$T_1 = T_2 \quad \text{Isotérmico}$$

$$\frac{p_1 V_1}{\cancel{R}} = \frac{p_2 V_2}{\cancel{R}}$$

$$P_1 V_1 = P_2 V_2$$

Comp.

$$V_2 = \frac{P_1 V_1}{P_2}$$
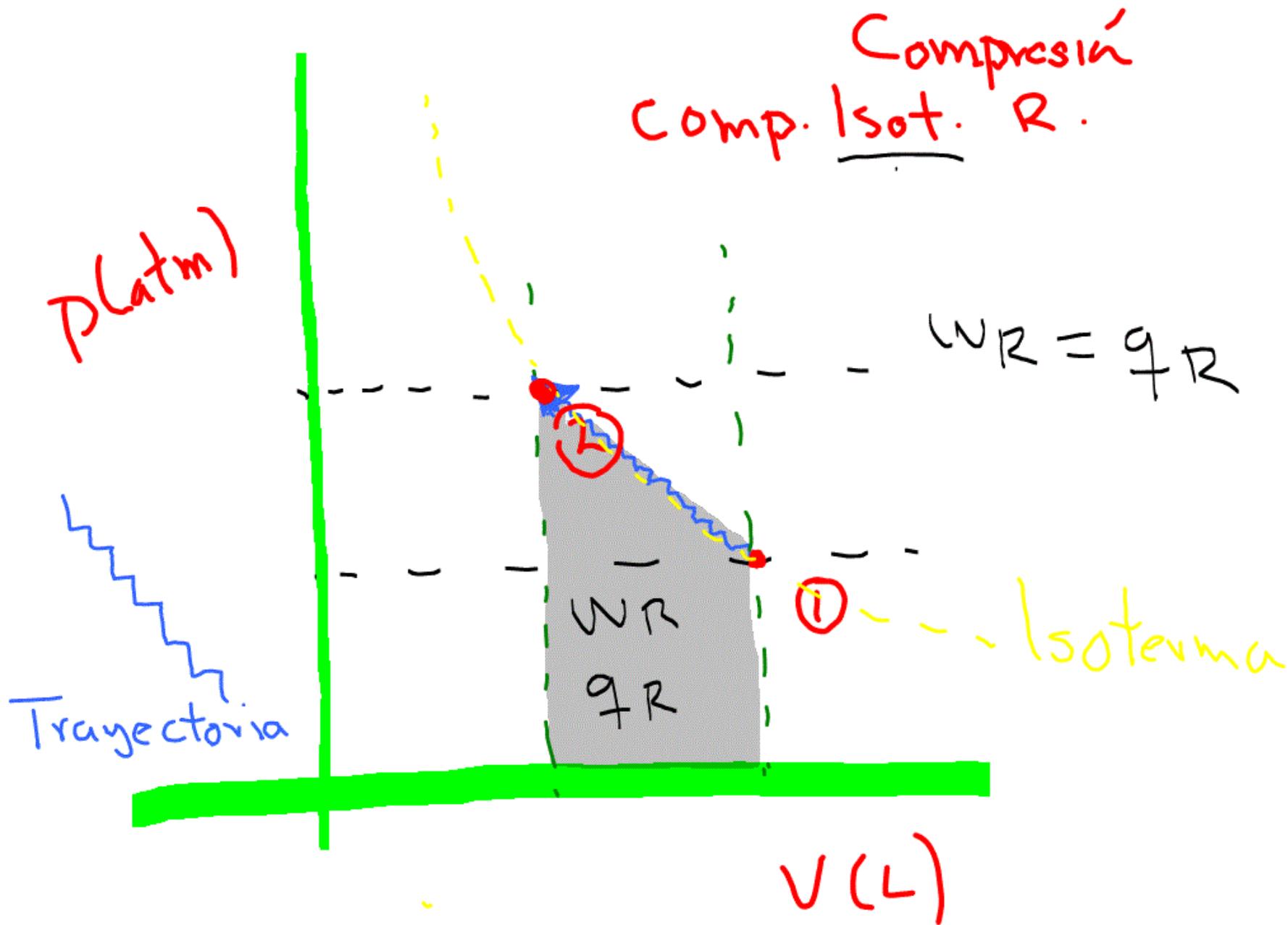
$$P_2 = \frac{P_1 V_1}{V_2}$$

$$P_1 V_1 = P_2 V_2$$

$$\left(\frac{N}{m^2}\right)\left(m^3\right) = \left(\frac{N}{m^2}\right)\left(m^3\right)$$

$$N \cdot m = N \cdot m$$

$$J = J$$

energía

Compresión

Comp. Isot. R.

$p(atm)$

$W_R = qR$

Trayectoria

W_R
qR

①   Isoterma

$V(L)$

$$W = F \times d$$

$$= P \times \Delta V$$

$$\int_{1}^{2} dW = P \int_{V_1}^{V_2} dV \qquad P = \frac{nRT}{V}$$

$$\boxed{\Delta \cancel{}}$$

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

Comp.

$$W_R = \boxed{nRT} \; \boxed{\ln \frac{V_2}{V_1}} = -$$

$$W_R = nRT \ln \frac{P_1}{P_2} = -$$

Compresión
Comp. <u>Isot</u>. IR.

$p(atm)$

$W_{IR} = q_{IR}$

②

W_{IR}
q_{IR}

Trayectoria

① - - - Isoterma

$V(L)$
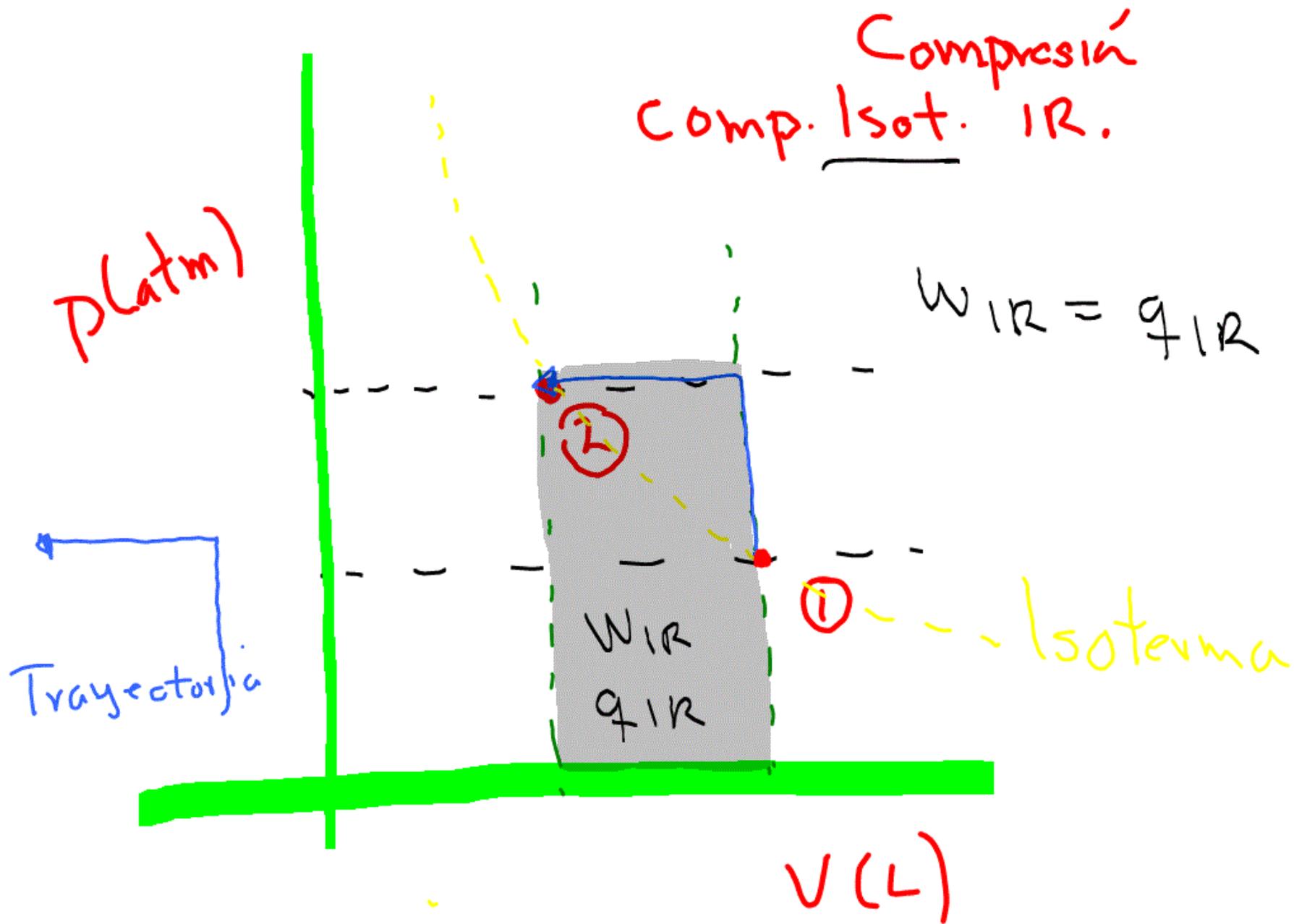
$$\left|-\frac{50\,J}{K}\right| < \left|-\frac{100\,J}{K}\right|$$

$$|W_R| < |W_{IR}|$$

$$|q_R| < |q_{IR}|$$

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

$$\Delta U_R = \Delta U_{IR} = 0$$

$$|\Delta S_R| \overset{\checkmark}{<} |\Delta S_{IR}| = -$$

Exp · Isot · R ·

p(atm)

Trayectoria

①

WR
qR

②

Isoterma

V (L)

p(atm)

Exp. Isot. 1R.

①

②

Trayectoria

W1R
q1R

Isoterma

V(L)
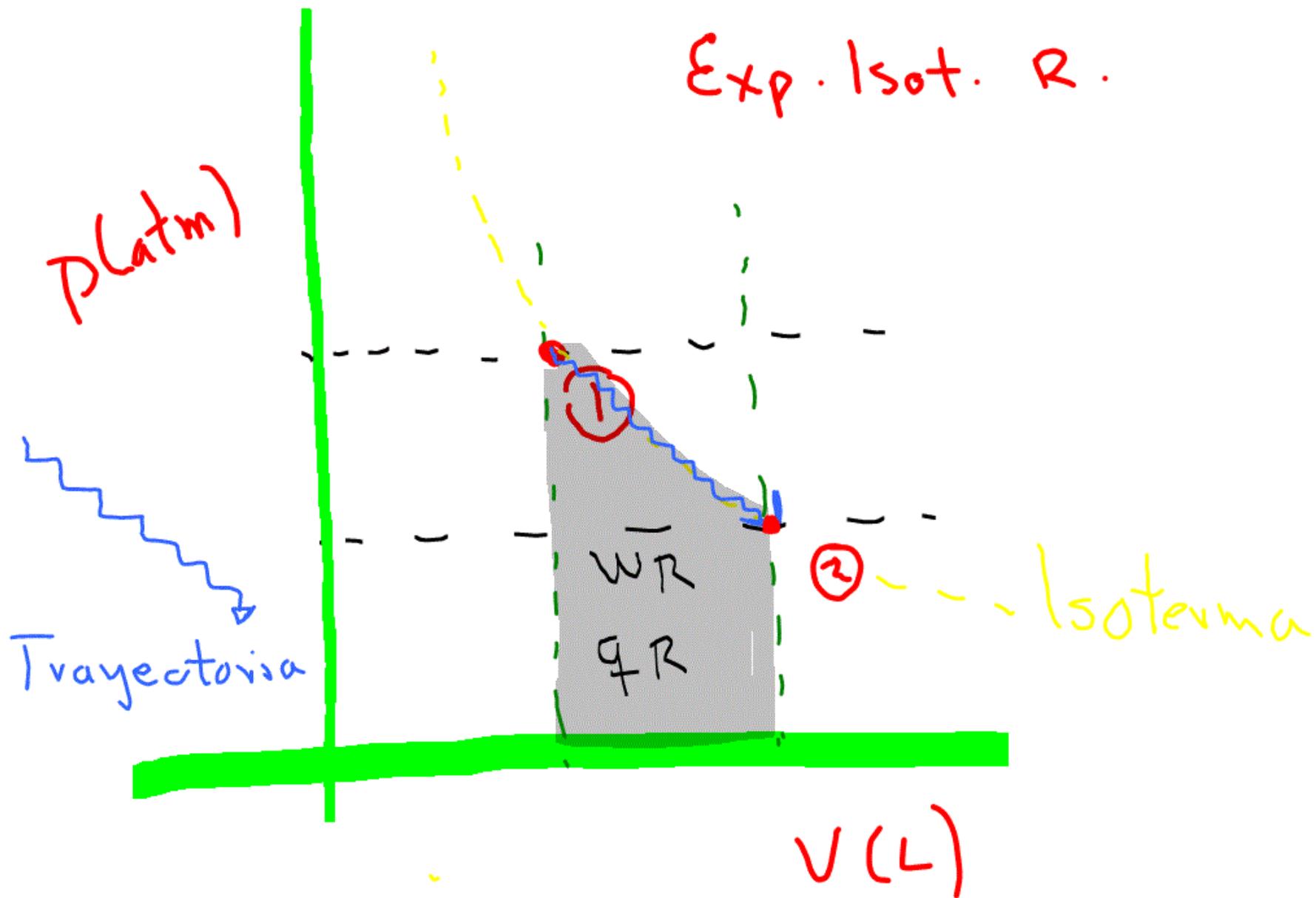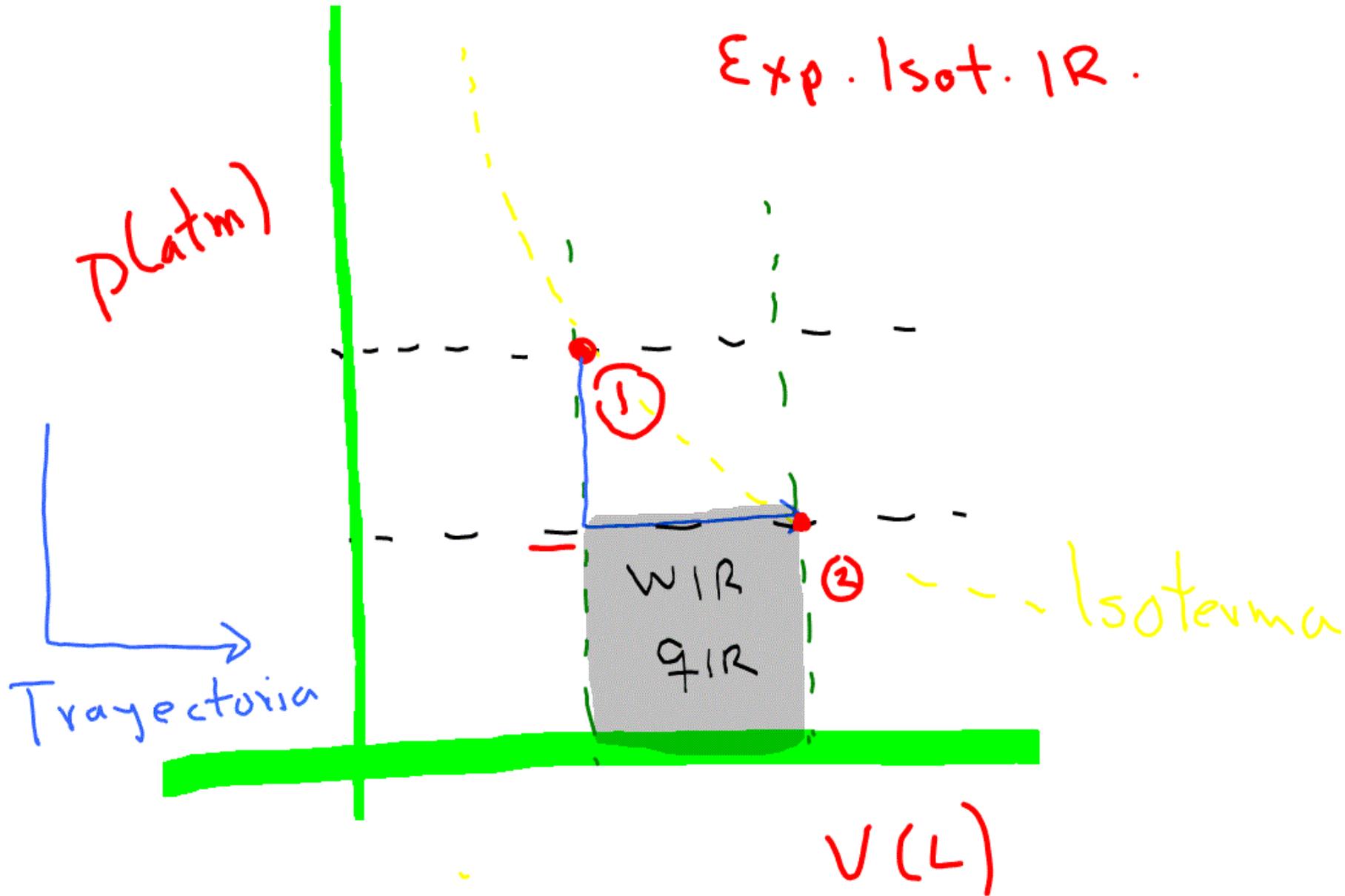
$$\mathcal{E}xp. \ Isot.$$

$$W_R > W_{IR}$$

$$q_R > q_{IR}$$

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

$$\Delta U_R = \Delta U_{IR} = 0$$

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

$$W_{IR} = ? = \text{rectángulo} = b \times h \quad \text{Área}$$

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

$$= nRT \ln \frac{P_1}{P_2}$$

$$W_{IR} = P_2 \Delta V$$

$$= \frac{N}{m^2} (m^3) = N \cdot m = J$$

$$W_{IR} = p\,\Delta V$$

$$= (atm)(L)\left(\frac{1.01325 \times 10^5\, N/m^2}{atm}\right)\left(\frac{1\,m^3}{10^3\,L}\right)$$

$$= N \cdot m = J$$

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

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

Comp. Isot. R.

$S \left(\frac{J}{K} \right)$

$q_7 R$

①

②

$\overline{(J)}_x (K)$

$T (K)$

Comp. Isot. IR

$S \left(\dfrac{J}{K} \right)$

q_{IR}

①

②

$\left(\dfrac{\bar{J}}{K} \right) \left(K \right)$

$T (K)$

Comp. Isot. IR.

$T(K)$

q_{IR}

②

①

$S (J/K)$