Universidad Nacional de Río Negro

Física III B – 2021

- **Unidad** 02
- **Clase** U02 C02 - 08/30
- **Fecha** 10 Abr 2021
- **Cont** Transformaciones y Ciclos
- **Cátedra** Asorey - Calderón
- **Web** https://gitlab.com/asoreyh/unrn-f3b

RIO NEGRO

Notas de clase

$Q = \Delta U + W$ transformación isotérmica

$\Delta U = \frac{z}{2} R n \Delta T$ si $\Delta T = 0 \Rightarrow \Delta U = 0 \Rightarrow$ transf. isotérmico $\boxed{Q = W}$

$Q = C n \Delta T$? C_0 C_p C_T

$T_B = T_C$

$dW = d(VP)$ $P = cte$

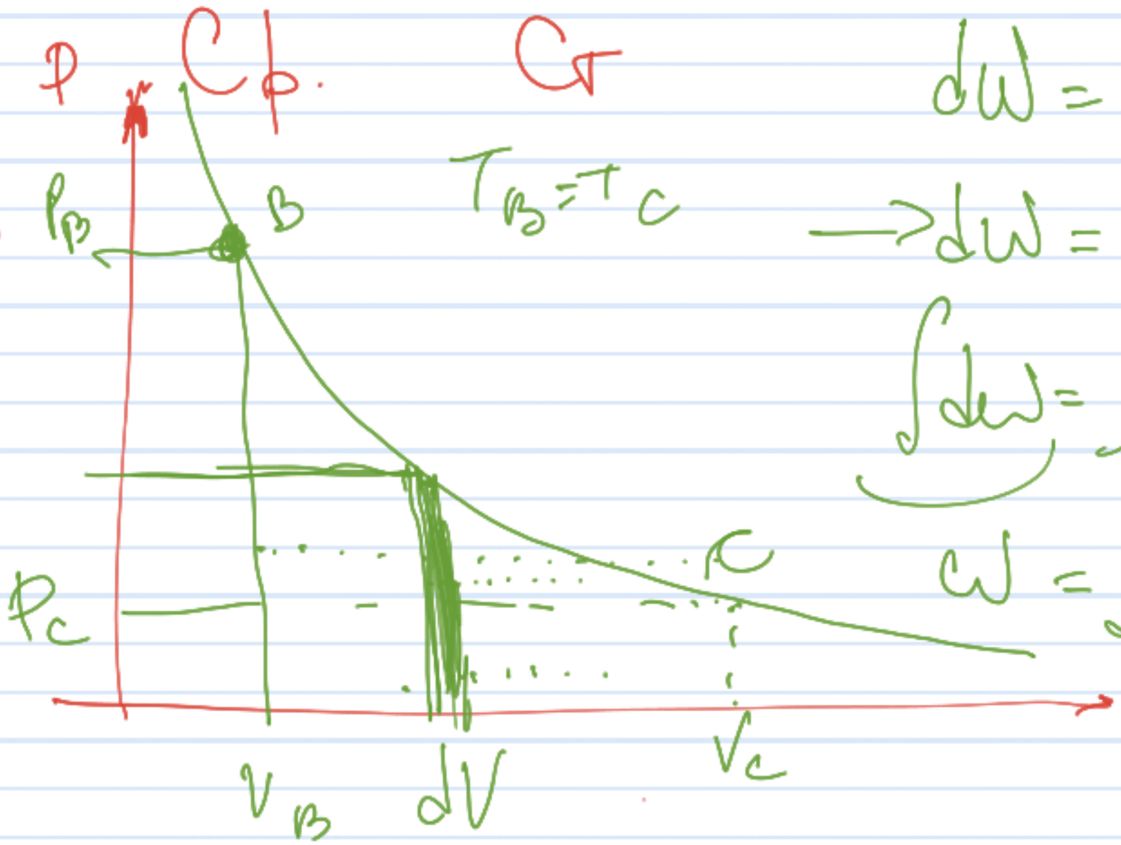
$\rightarrow dW = p\,dV$ sea un tiempo dt

$\int dW = \int p\,dV$ $pV = nRT \Rightarrow p = \frac{nRT}{V}$

$W = \int p\,dV = \int \frac{nRT}{V}\,dV$

$W = nRT \int_{V_B}^{V_C} \frac{dV}{V}$

$\int_{x_1}^{x_2} \frac{dx}{x} = \ln$



$$W = nRT \int_{V_B}^{V_C} \frac{dV}{V} \Rightarrow W = nRT \cdot \ln(V)\Big|_{V_B}^{V_C} = nRT\left(\ln V_C - \ln V_B\right)$$

$$\Rightarrow W = nRT \ln \frac{V_C}{V_B} \Rightarrow \boxed{W = nRT \ln V_f/V_i}$$

trabajo a temperatura constante.

$$\boxed{W = Q.}$$

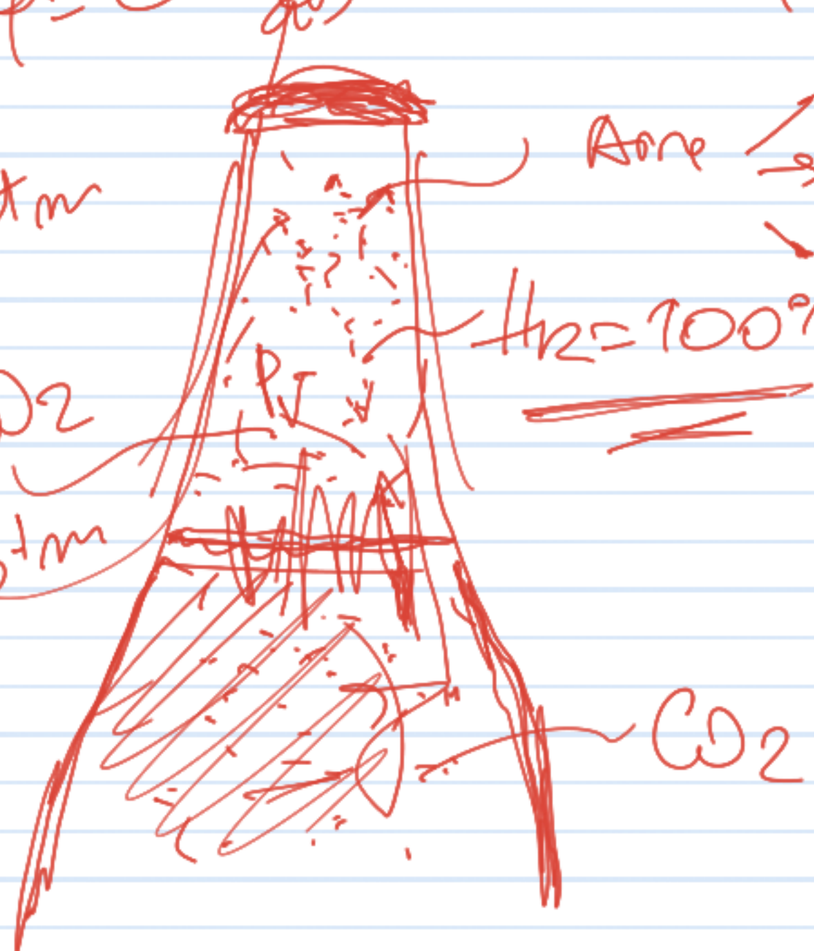
ADIABÁTICO →

No hay intercambio de calor.

Colorímetro

$Q = 0$ → $0 = \Delta U + W$ → $W = -\Delta U$

$\Delta T \downarrow$



P_{atm}

Aire → 21 % O_2, 78 % N_2, 1 % Ar

$Hr = 100\%$

CO_2

400 ppm CO_2

H_2O.

$P > P_{atm}$

CO_2

$\gamma = C_p / C_v \Rightarrow \frac{\frac{i+2}{2}}{i/2} = \boxed{\frac{i+2}{i} = \gamma}$ ← Coeficiente Adiabatico

$Q = 0 \Rightarrow W = -\Delta U \rightarrow \boxed{dW = -dU}$

$dU = \frac{i}{2} nR\,dT = \frac{i}{2} d(nRT)$ ($nRT = PV$)

$dU = \frac{i}{2} \cdot d(pV) \Rightarrow \boxed{dU = \frac{i}{2} \cdot (dp \cdot V + p\,dV)}$ $\quad dW = p\,dV$

$p\,dW = -\frac{i}{2}\left[V\,dp + p\,dV\right] \Rightarrow p\,dV = -\frac{i}{2} V\,dp - \frac{i}{2} p\,dV$

$p\,dV + \frac{i}{2} p\,dV = -V\,dp \cdot \frac{i}{2\gamma} \Rightarrow \left(\frac{i}{2} + 1\right) p\,dV = -\frac{i}{2} V\,dp$

$\left(\frac{i+2}{2}\right) p\,dV = -\frac{i}{2} V\,dp \Rightarrow \frac{i+2}{i} \cdot \frac{i}{2}\, p\,dV = -V\,dp \Rightarrow \gamma\, p\,dV = -V\,dp$

$$\gamma\, p\, dV = -V\, dp$$

$$\Rightarrow \gamma \cdot \frac{dV}{V} = -\frac{dp}{p} \Rightarrow -\gamma \frac{dV}{V} = \frac{dp}{p}$$

$$-\gamma \int_{V_i}^{V_f} \frac{dV}{V} = \int_{p_i}^{p_f} \frac{dp}{p} \Rightarrow -\gamma \ln\left(\frac{V_f}{V_0}\right) = \ln\left(\frac{p_f}{p_i}\right) \Rightarrow \ln\left(\frac{V_i}{V_f}\right)^{\gamma} = \ln\left(\frac{p_f}{p_i}\right)$$

$$\ln a = \ln b \Leftrightarrow a = b \Rightarrow \left(\frac{V_i}{V_f}\right)^{\gamma} = \frac{p_f}{p_i} \Rightarrow \frac{V_i^{\gamma}}{V_f^{\gamma}} = \frac{p_f}{p_i}$$

$$\Rightarrow p_i V_i^{\gamma} = p_f \cdot V_f^{\gamma} \Rightarrow \boxed{p \cdot V^{\gamma} = cte} \qquad \gamma = C_p / C_V$$

Tyv // pyT //
nyT // nyv

Transf. Adiabática

$\Delta U = \frac{z}{2} n R \Delta T$

Estado final = Estado inicial

$P_f, V_f, T_f, n_f = P_i, V_i, T_i, n_i$

$\Delta T = 0 \Rightarrow \underline{\Delta U = 0}$

En ciclo $\underline{\Delta U = 0}$.