Universidad Nacional de Río Negro
Física III B – 2021

- **Unidad** 01
- **Clase** U01 C05 - 05/30
- **Fecha** 30 Mar 2021
- **Cont** Energía Interna y calor específico
- **Cátedra** Asorey
- **Web** https://gitlab.com/asoreyh/unrn-f3b

RIO NEGRO

Notas de clase

$$\langle E_K \rangle = \frac{3}{2} K_B T$$

$$[K_B] = \frac{J}{K} \qquad [KT] = \frac{J}{K} \cdot K = J$$

N partículas $\quad E_{K\,i} \quad i = 1 \dots N$

$$U = \frac{N}{N} \sum_{i=1}^{N} E_{Ki} \quad \langle E_K \rangle \Rightarrow U = N \langle E_K \rangle$$

Gas ideal monoatómico

$$U = N \cdot \frac{3}{2} K_B T \Rightarrow U = \frac{3}{2} \underbrace{N \cdot \frac{N_A}{N_A}}_{n} \cdot \underbrace{K_B}_{R} T \Rightarrow \boxed{U = \frac{3}{2} n R T}$$

$$U = \left(\frac{3}{2}R\right) n T \quad \Rightarrow \quad dU = \left(\frac{3}{2}R\right) \cdot \left[\dot{n}\, dT + n\, d\dot{T}\right]$$

Si $n = cte \Rightarrow dn = 0 \Rightarrow dU = \frac{3}{2} R \cdot n\, dT$ @ $n = cte$

$$\boxed{\Delta U = \frac{3}{2} R n \Delta T}$$

El cambio de Energía interna solo se produce si hay un cambio en la Temperatura.

$$C \overset{def}{=} \frac{Q}{n \Delta T} \Rightarrow Q = C n \Delta T$$

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transformación a V = cte $\Rightarrow W = 0$

$$Q = \Delta U$$

$$C n \Delta T = \frac{3}{2} R n \Delta T$$

$$\boxed{C_V = \frac{3}{2} R}$$

a $P = cte$ $\Rightarrow$ $\Delta T \uparrow$, $\Delta V \uparrow$

$W = p \Delta V$

$PV = nRT \Rightarrow P \Delta V = nR \Delta T \Rightarrow \Delta V = \frac{nR \Delta T}{P}$

$$\boxed{W = \cancel{P} \frac{nR \Delta T}{\cancel{P}} = nR \Delta T}$$

$Q = \Delta U + W \Rightarrow Q = \frac{3}{2} nR \Delta T + nR \Delta T$ (ΔU, W)

$C_p \cdot n \Delta T = \frac{3}{2} nR \Delta T + nR \Delta T$ (C_V)

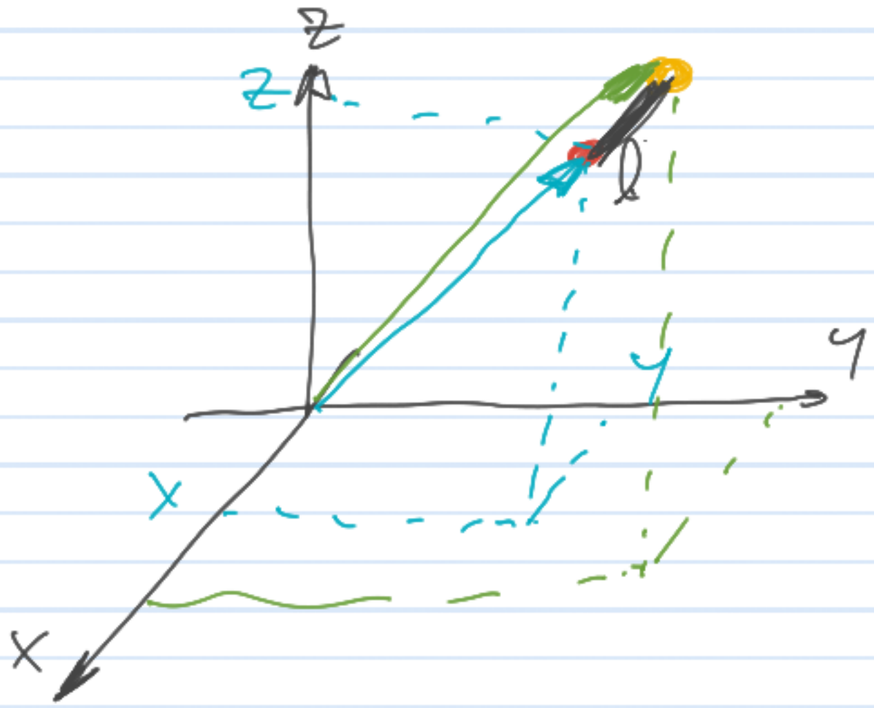
$C_p = \frac{3}{2} R + R$

$$C_p = C_v + R$$

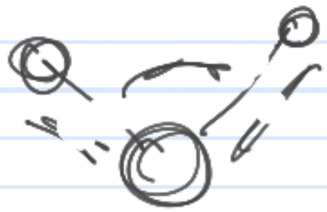
Calor específico de un gas ideal a $P = cte$.

$$C_v = \frac{3}{2} R \Rightarrow C_p = \frac{3}{2} R + R \Rightarrow C_p = \frac{5}{2} R$$

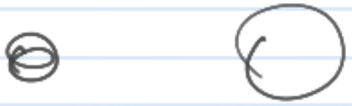
$$C_p = \frac{3}{2} R + R = R\left(\frac{3}{2} + 1\right) = R \cdot \frac{5}{2}$$



$(6-1) = 5$ grados de libertad.



H_2O



En un gas ideal que tiene 7 grados de libertad

monoatómico $z=3 \Rightarrow C_V = \frac{z}{2}R = \frac{3}{2}R$

biatómico $z=5 \Rightarrow C_V = \frac{z}{2}R = \frac{5}{2}R$

triatómico $z=6 \Rightarrow C_V = \frac{z}{2}R = \frac{6}{2}R = 3R$