Clase 8 7 Septiembre 2021

Título de la nota 07/09/2021

Variables

- T

- Intensivas: T, P no se suman
- y_i, x_i suman
- extensivas: n, V

∴ se suman

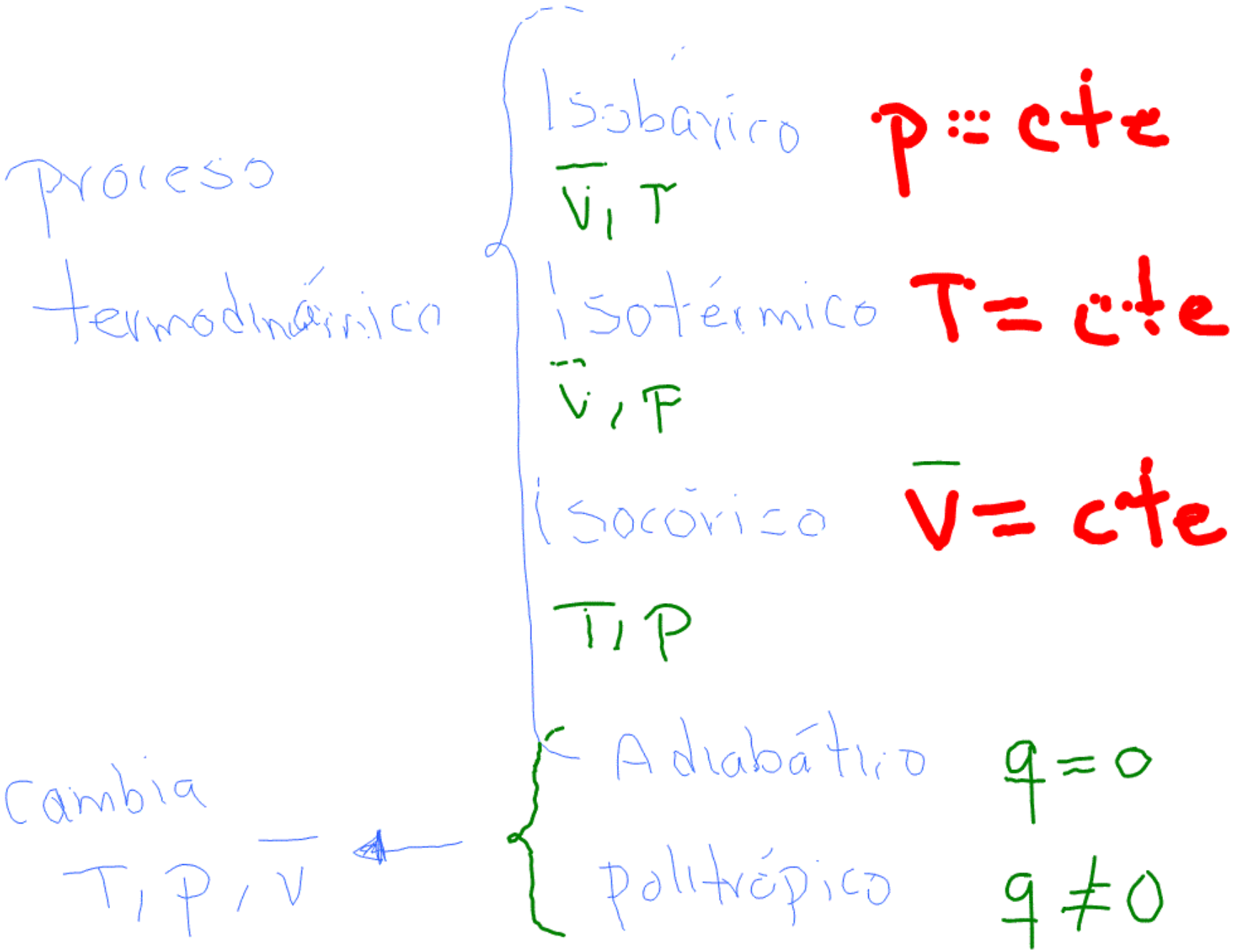
4 variables en 4 dimensiones

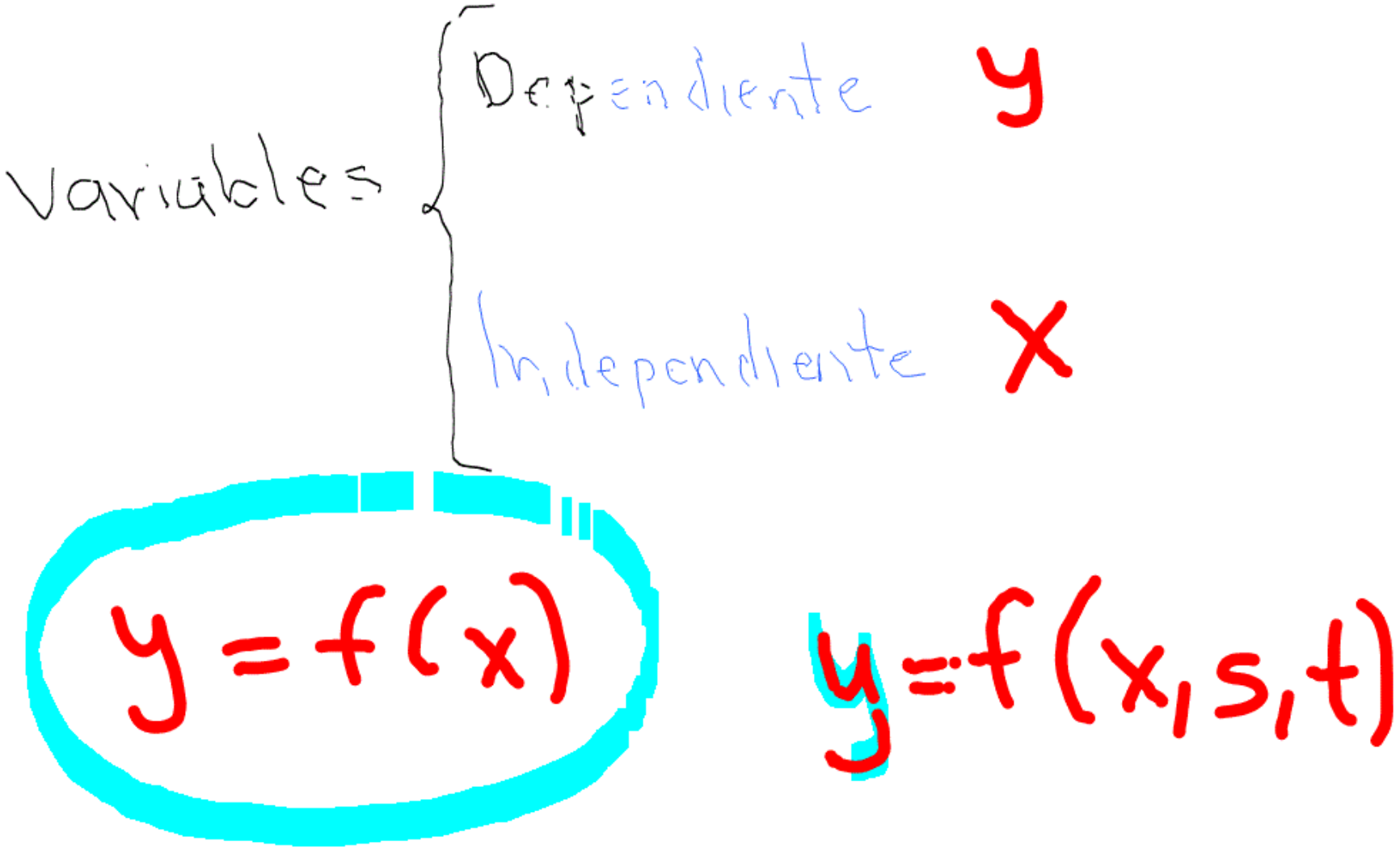
Intensivas → extensivas ✗

extensivas → intensivas ✓

$\frac{V}{n} = \bar{V}$ ≡ volumen molar

$\frac{V}{m} = \hat{V}$ = volumen específico


Proceso termodinámico
Isobárico
$\bar{V}$, T
P = cte
Isotérmico
$\bar{V}$, P
T = cte
Isocórico
$\bar{V}$ = cte
T, P
Adiabático
q = 0
politrópico
q ≠ 0
Cambia
T, P, $\bar{V}$

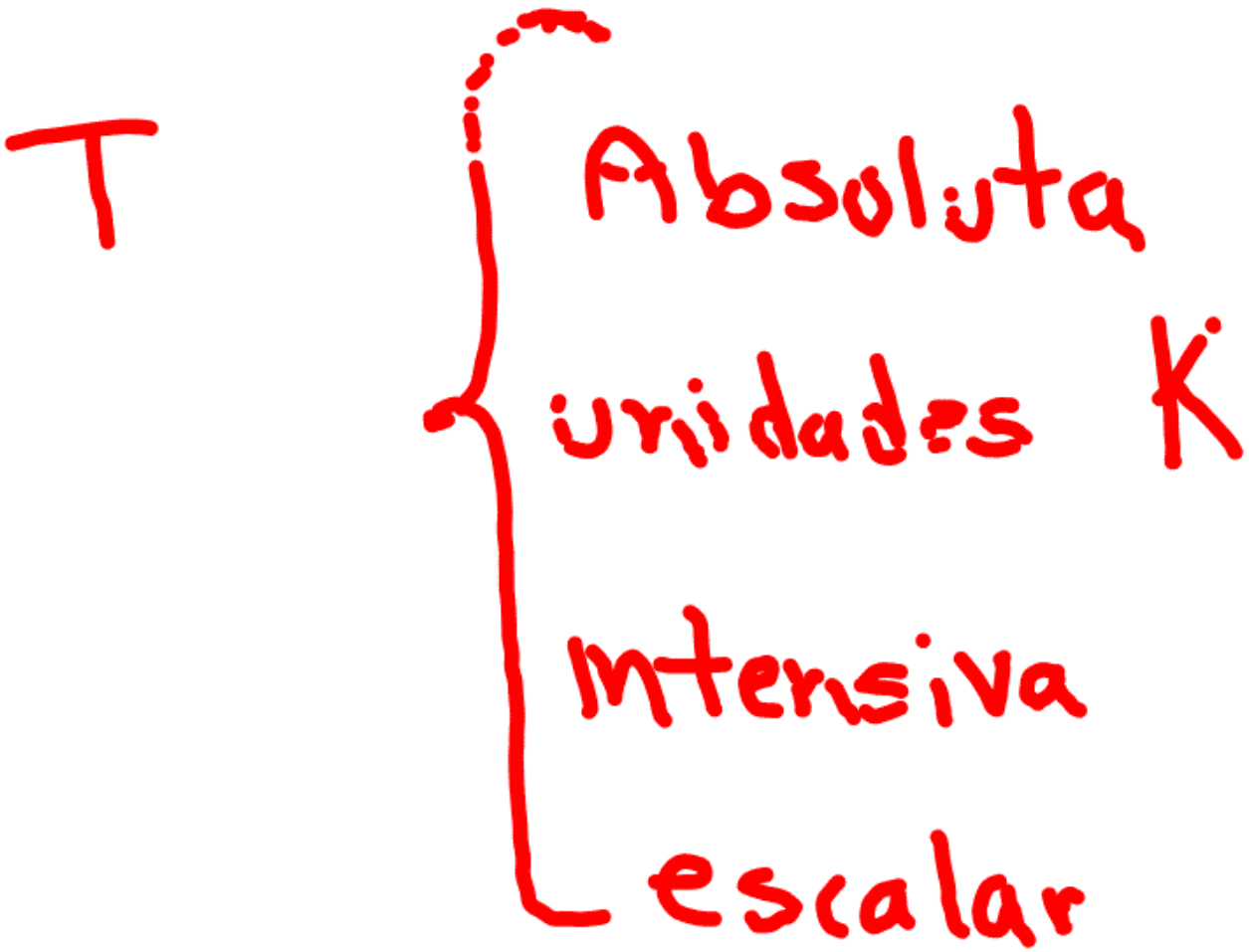

Variables
Dependiente
y
Independiente
x
y=f(x)
y=f(x,s,t)

$$V = f(p, T, n)$$

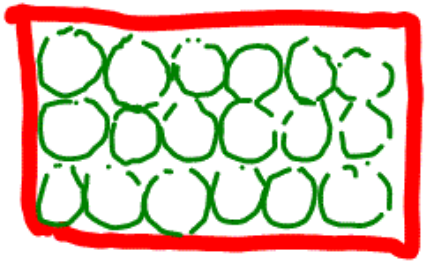
$$V \propto \frac{1}{p} \quad \text{Boyle}$$

$$V \propto T \quad \text{Charles}$$

$$V \propto n \quad \text{Avogadro}$$


T
Absoluta
unidades K
Intensiva
escalar

Volumen
- extensivo
- unidades m^3
- absoluta



Presión
- absoluta
- $\frac{N}{m^2}$ = Pascal = Pa
- intensiva

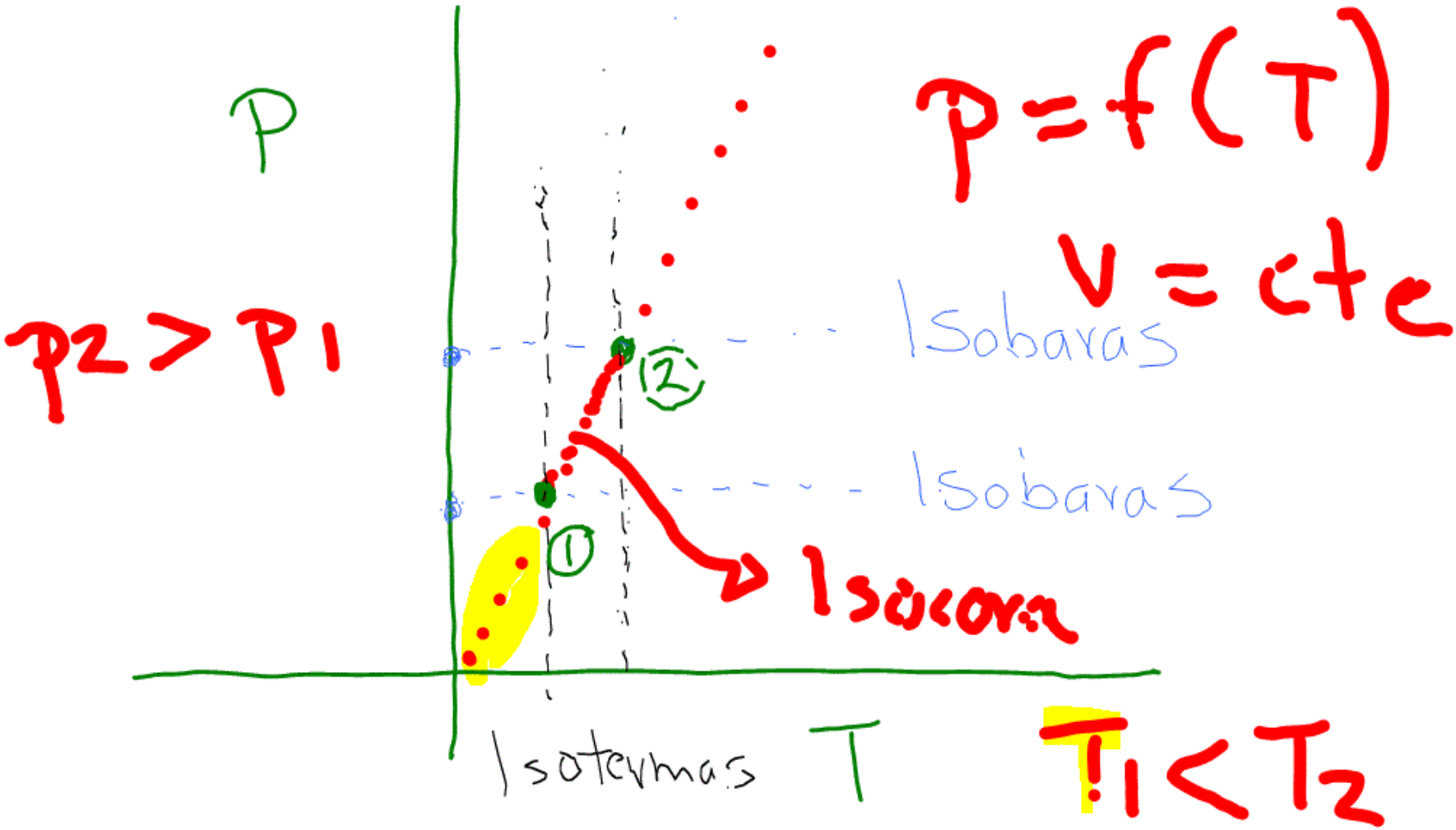
Presión absoluta = Pman + Pbar

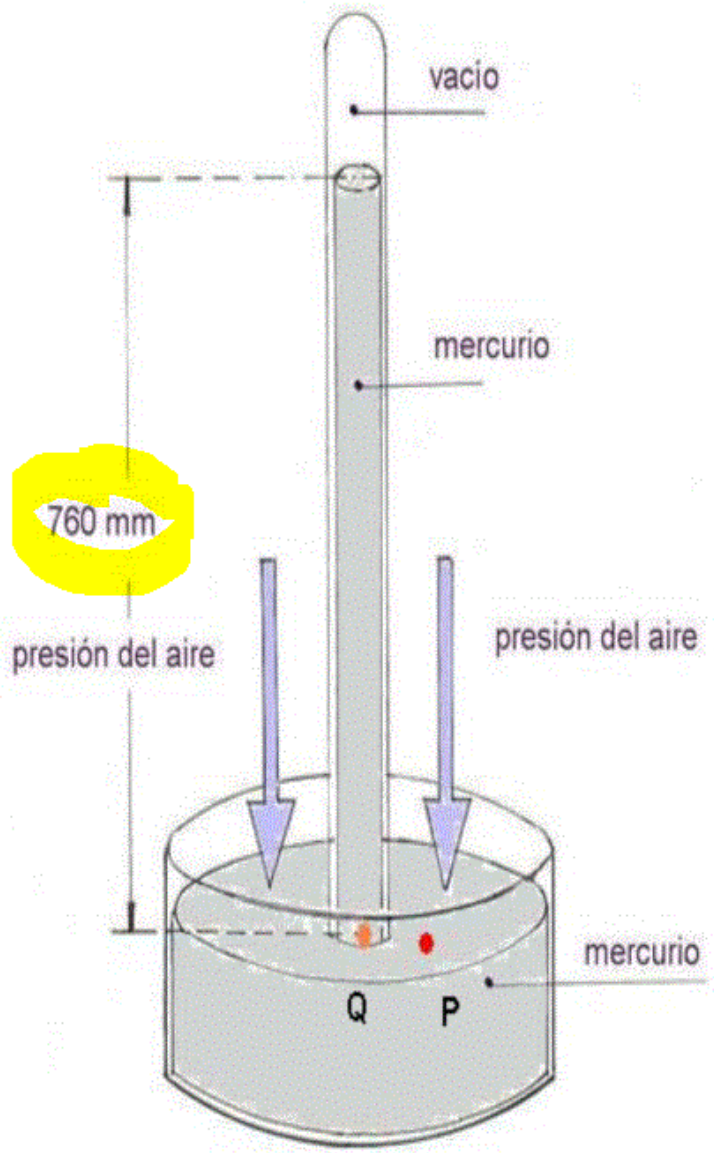
Pman = Psist.

} Sist. cerrados aislados

Pbar = Patmosférica

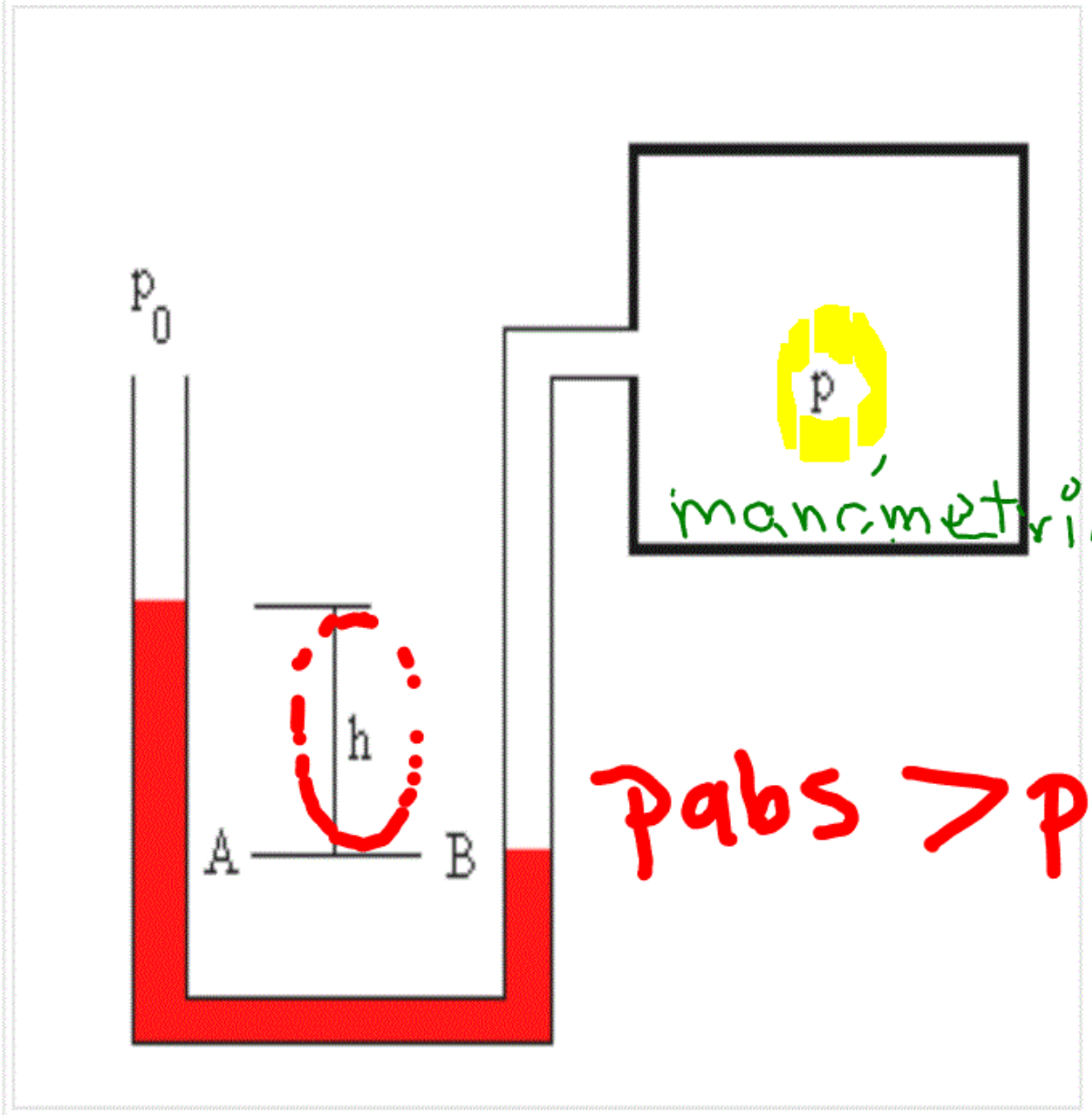
Isocórica

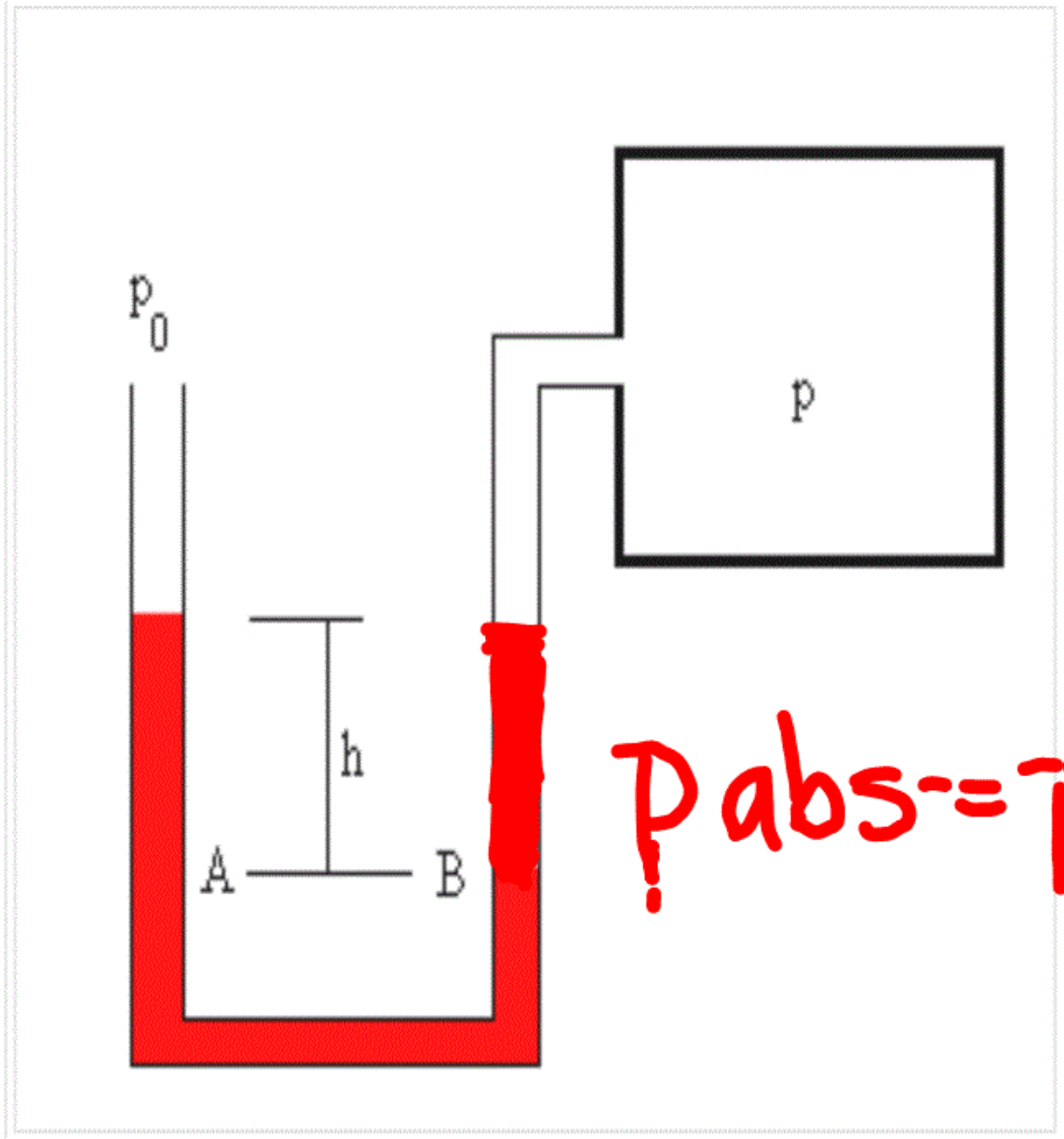

P
p=f(T)
V = cte
p2 > p1
Isobaras
Isobaras
2
1
Isocora
Isotermas T
T1 < T2

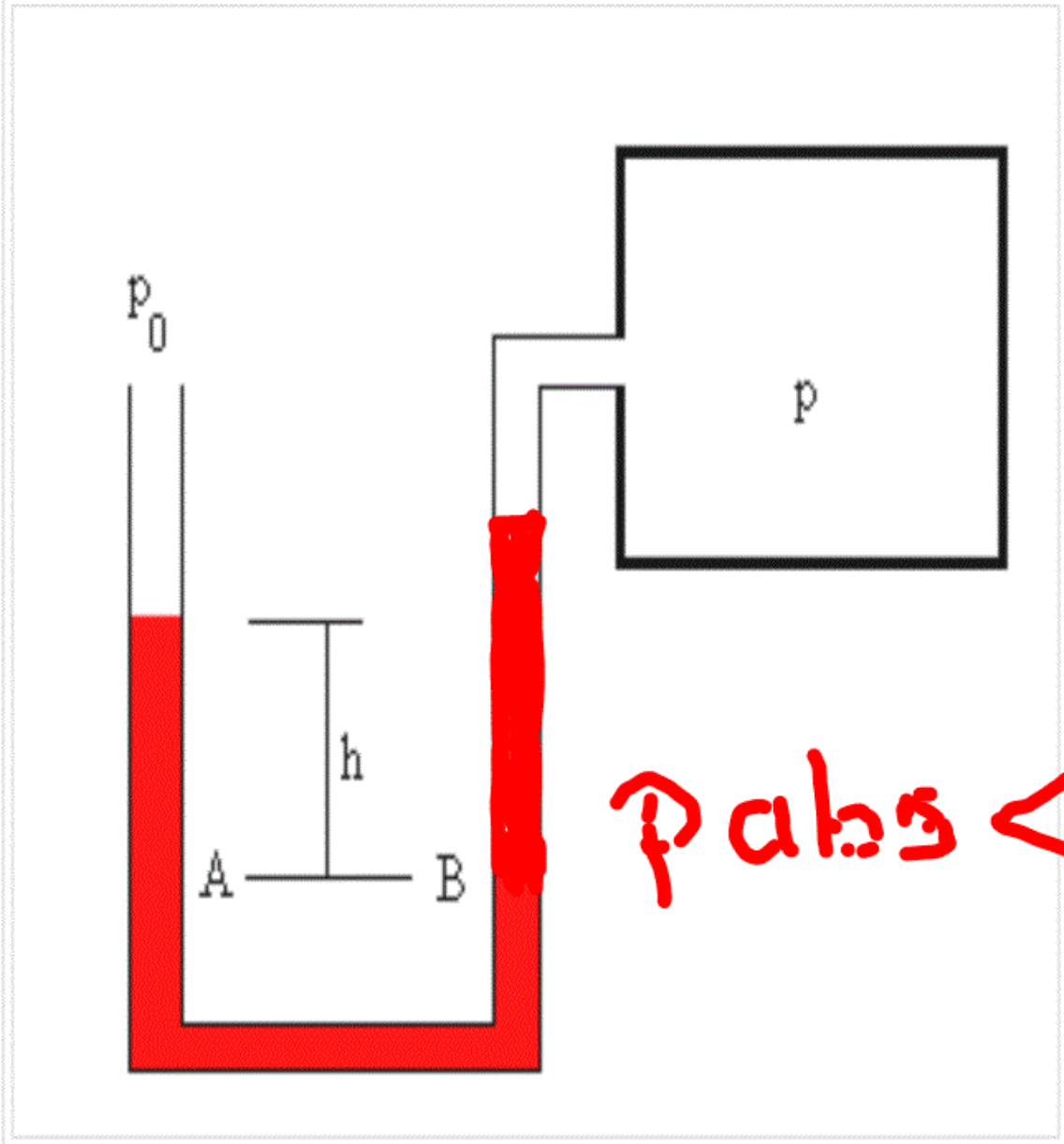


P barométrica

1 atm = 760 mm Hg


p0
p
manométrica
h
A
B
pabs > patm


p_0
p
h
A
B
Pabs=patm


p_0
p
h
A
B
Pabs<patm

$$p_{abs} = p_{man} + p_{atm}$$

$p_{abs} > p_{atm}$ $p_{man} = +$

$p_{abs} < p_{atm}$ $p_{man} = -$

$p_{abs} = p_{atm}$ $p_{man} = 0$

$P_H = \rho g h$

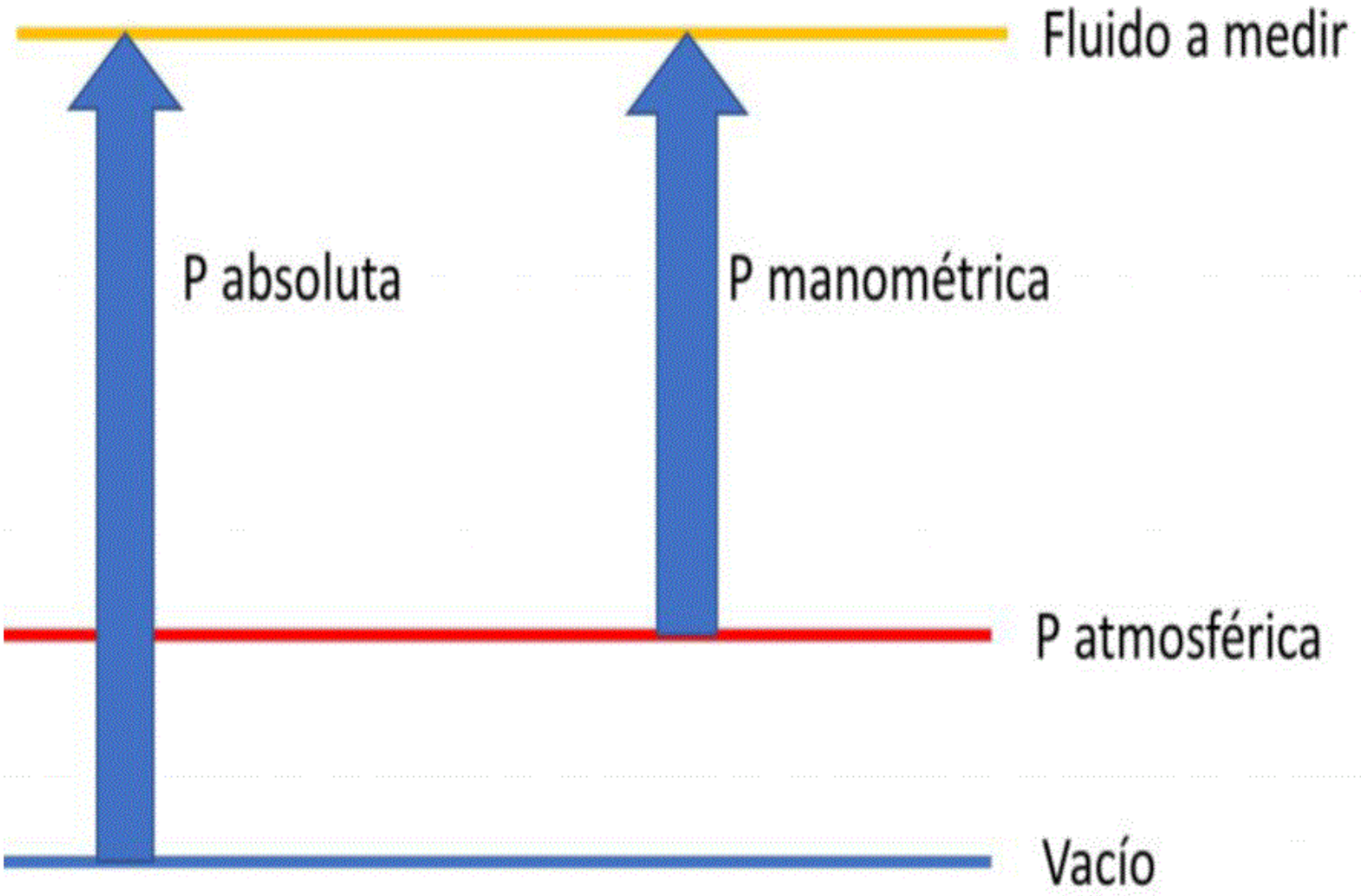
$P_H = (1000\ kg/m^3)(9.81\ m/s^2)(20m)$

$P_H = 196200\ Pa$

$P_{abs} = P_{atm} + P_H$

$P_{abs} = 1.013 \times 10^5\ Pa + 196200\ Pa$

$P_{abs} = 297500\ Pa$


Fluido a medir
P absoluta
P manométrica
P atmosférica
Vacío

$$V = \frac{K_1}{P}$$

$$V = K_2 T \qquad V = K_3 n$$

$$V = f(P, T, n)$$

$$dV = \left(\frac{\partial V}{\partial P}\right)_{T,n} dP + \left(\frac{\partial V}{\partial T}\right)_{P,n} dT + \left(\frac{\partial V}{\partial n}\right)_{T,P} dn$$

$$\frac{\partial V}{\partial p} = -\frac{K_1}{p^2}$$

$$V = \frac{K_1}{p}$$

$$K_1 = pV$$

$$\frac{\partial V}{\partial T} = K_2$$

$$V = K_2 T$$

$$K_2 = \frac{V}{T}$$

$$\frac{\partial V}{\partial n} = K_3$$

$$V = K_3 n$$

$$K_3 = \frac{V}{n}$$

$$dV = -\frac{K_1}{P^2}\,dp + K_2\,dT + K_3\,dn$$

$$dV = -\frac{PV}{P^2}\,dp + \frac{V}{T}\,dT + \frac{V}{n}\,dn$$

$$dV = -\frac{V}{P}\,dp + \frac{V}{T}\,dT + \frac{V}{n}\,dn$$

$$\int \frac{dV}{V} = -\int \frac{dp}{P} + \int \frac{dT}{T} + \int \frac{dn}{n}$$

$$\ln V = -\ln P + \ln T + \ln n + \ln k$$

$$\ln V = \ln\left(\frac{T n k}{P}\right) \qquad k = R$$

$$e \qquad e$$

$$\boxed{V = \frac{nRT}{P}}$$

$$PV = nRT$$

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

Energía

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

$$= J$$

$$J = J$$

Ley conservación energía.