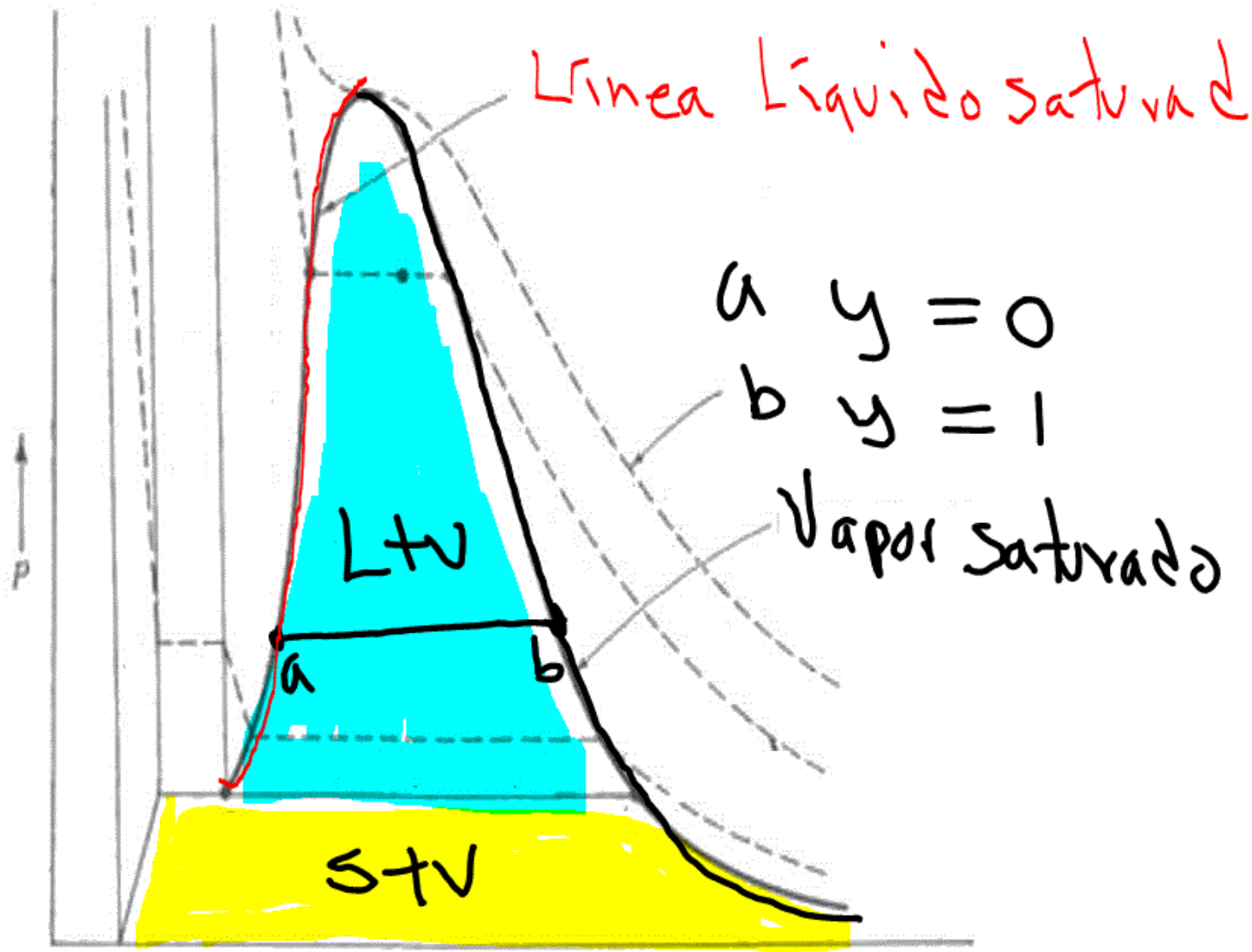
Clase 70 8 diciembre 2021

Título de la nota 08/12/2021



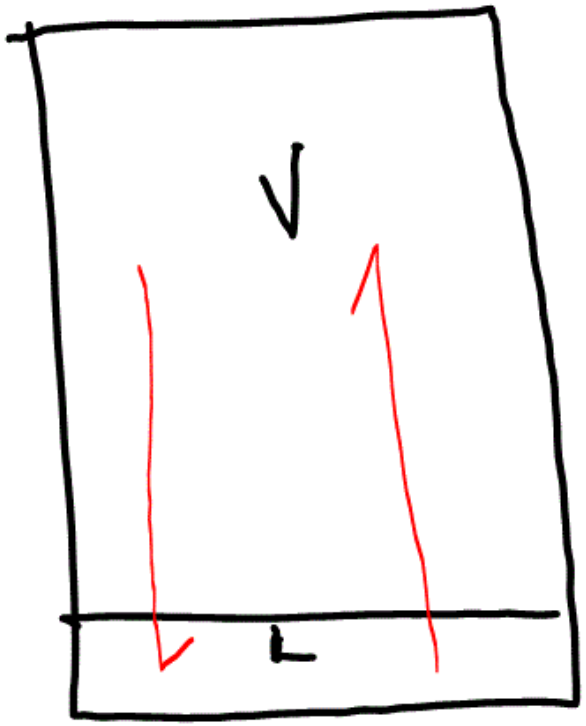
Sustancia pura

$$y = \frac{n_v}{n_v + n_L}$$

$$y = \frac{n_v}{n_{total\,s}} = \frac{m_v/M}{m_v/M + m_L/M}$$

$$y = \frac{m_v}{m_v + m_L}$$

Calidad de vapor

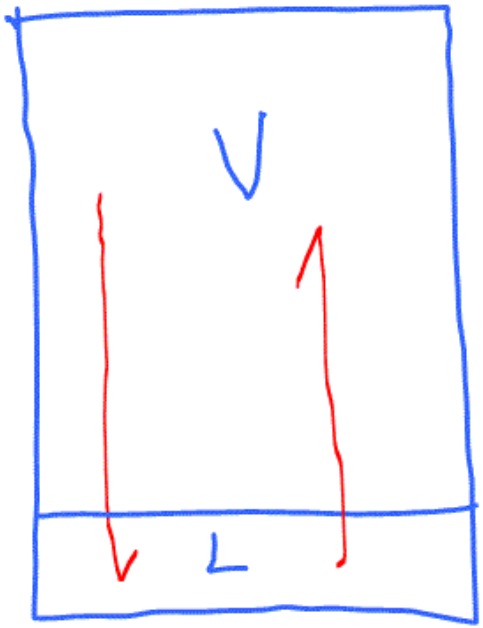


$$V_{Total} = V_V + V_L$$

$$\tilde{V}_{Total} = \tilde{V}_V + \tilde{V}_L$$

$$\frac{L}{kg}$$

$$\tilde{V}_T = y\tilde{V}_V + (1-y)\tilde{V}_L$$



$V_T = 3400\,L$

$1\,Kg$ agua

$T = 80°C$

$$\tilde{V}_+ = \frac{V_T}{m_T}$$

$$\tilde{V}_+ = \frac{3400\,L}{1\,Kg} = 3400\,L/Kg$$

Tabla I. Propiedades termodinámicas del agua.

Región de dos fases: liquido y vapor saturados									
T	p	Volumen.		U		H		S	
°C	bar	Líquido L/kg	Vapor m³/kg	Líquido kJ/kg	Vapor kJ/kg	Líquido kJ/kg	Vapor kJ/kg	Líquido kJ/kgK	Vapor kJ/kgK
80	0.4736	1.0293	3.41	334.67	2481	334.72	2642.5	1.0747	7.6088

$(1.0293 - 3410\ L)/kg$

Vaporización total.

$$\tilde{V}_T = y\tilde{V}_V + (1-y)\tilde{V}_L$$

$$\tilde{V}_T = y\tilde{V}_V + \tilde{V}_L - y\tilde{V}_L$$

$$\tilde{V}_T - \hat{V}_L = y\tilde{V}_V - y\tilde{V}_L$$

$$\tilde{V}_T - \tilde{V}_L = y(\tilde{V}_V - \tilde{V}_L)$$

$$\tilde{V}_T - \tilde{V}_L = y\left(\tilde{V}_V - \tilde{V}_L\right)$$

$$y = \frac{\tilde{V}_T - \tilde{V}_L}{\tilde{V}_V - \tilde{V}_L}$$

$$y = \frac{\left(3400\ L/Kg - 1.0293\ L/Kg\right)}{\left(3410\ L/Kg - 1.0293\ L/Kg\right)}$$

$$y = 0.99707$$

$$m_v = y m_T = 0.99707\,(1\,kg)$$

$$= 0.99707\,kg$$

$$m_L = m_T - m_v = 1\,kg - 0.99707\,kg$$

$$= 0.00293\,kg$$

$$V_V = m_V \tilde{V}_V$$

$$= 0.99707 \text{ kg} \left(\frac{3410 \text{ L}}{\text{kg}} \right)$$

$$= 3399.9970 \text{ L}$$

$$V_L = V_T - V_V = 3400 \text{ L} - 3399.9970 \text{ L}$$

$$= 0.0030 \text{ L}$$

$$\overline{\Delta H_v} = 9720 \text{ cal/mol}$$

Tabla I. Propiedades termodinámicas del agua.

Región de dos fases: liquido y vapor saturados

T	p	Volumen.		U		H		S	
°C	bar	Líquido L/kg	Vapor m³/kg	Líquido kJ/kg	Vapor kJ/kg	Líquido kJ/kg	Vapor kJ/kg	Líquido kJ/kgK	Vapor kJ/kgK
100	1.0132	1.0438	1.673	418.77	2504.9	418.88	2674.4	1.3063	7.35

$$\tilde{\Delta H_v} = \tilde{H_v} - \tilde{H_L}$$

$$= 2674.4 \text{ kJ/kg} - 418.88 \text{ kJ/kg}$$

$$= 2255.52 \text{ kJ/kg} = \text{J/g}$$

$$= (2255.52 \text{ J/g})(18 \text{ g/mol}) = 40599.36$$

$$\left(\frac{4059.36\ J}{mol}\right)\left(\frac{1\ cal}{4.186\ J}\right)$$

$$\overline{\Delta H_v} = 969.84\ cal/mol$$

$$= \left(585 \text{ mmHg}\right)\left(\frac{1.01325 \text{ bar}}{760 \text{ mmHg}}\right)$$

$$= 0.7799 \text{ bar}$$

90	0.7011	1.0363	2.361	376.68	2493.2	376.75	2658.7	1.192	7.4749
95	0.8453	1.04	1.982	397.71	2499.1	397.8	2666.6	1.2495	7.4114

bar

$$T=\frac{(T_2 - T_1)}{(p_2 - p_1)}(p - p_1)+T_1$$

donde p es el valor a interpolar

$$p=\frac{(p_2 - p_1)}{(T_2 - T_1)}(T - T_1)+p_1$$

donde T es el valor a interpolar

$$y = mx + b$$

$$T = \frac{(95-98)^\circ C}{(0.8453-0.7011)\text{bar}}(0.7799-0.7011)\text{bar} + 90^\circ C$$

$$= 92.73^\circ C$$