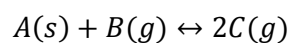


### Ejercicio nº4

#### P1

En un recipiente consistente en un émbolo con pistón, en el cual se puede mantener la presión constante en 1 atm, se introduce 1 mol de A(s) y 2 moles de B(g), los que reaccionan de acuerdo a:



Si inicialmente hay 0 moles de C, calcular la temperatura a la cual el número de moles de B y de C en la fase gas es el mismo.

Datos:

Sustancia	$\Delta G_f^\circ$ [Kcal/mol]	$\Delta H_f^\circ$ [Kcal/mol]
A(s)	12,81	-14,38
B(g)	94,72	34,67
C(g)	56,4	0

## Pauta ej. #4

• a 25°C :

$$\Delta G_{\text{rxn}}^{\circ} = \Delta G_{\text{p}}^{\circ} - \Delta G_{\text{r}}^{\circ} = 2 \times 56,4 - 12,81 - 94,72 = 5.270 \left[ \frac{\text{cal}}{\text{mol}} \right]$$

$$\Delta H_{\text{rxn}}^{\circ} = \Delta H_{\text{p}}^{\circ} - \Delta H_{\text{r}}^{\circ} = 2 \times (\text{---}) - (-14,38) - 34,67 = -20.290 \left[ \frac{\text{cal}}{\text{mol}} \right]$$

$$\Delta G^{\circ} = -RT \ln K_p \Rightarrow 5270 = -1,987 \left[ \frac{\text{cal}}{\text{mol} \cdot \text{K}} \right] \times 298 [\text{K}] \times \ln K_p$$

$$\Rightarrow K_p(25^{\circ}\text{C}) = 1,36 \times 10^{-4}$$

• a T<sub>eq</sub> (incógnita) :

	<u>A(s) + B(g) ⇌ 2C(g)</u>		
to	1	2	0
teq	1-x	2-x	2x
	= 1/3	= 4/3	= 4/3

$$\left. \begin{array}{l} n_B^{\text{eq}} = m_C^{\text{eq}} \\ \Rightarrow 2-x = 2x \\ \therefore x = 2/3 \end{array} \right\}$$

$$K_p(T_{\text{eq}}) = \frac{P_C^2}{P_B} \quad ; \quad \begin{array}{l} P_C = X_C P_t = \frac{m_C}{m_t} P_t \\ P_B = X_B P_t = \frac{m_B}{m_t} P_t \end{array} \quad \left( \begin{array}{l} \text{obs: } m_t \text{ sólo} \\ \text{de gases!} \end{array} \right)$$

$$\Rightarrow K_p(T_{\text{eq}}) = \frac{\frac{m_C^2}{m_t^2} P_t^2}{\frac{m_B}{m_t} P_t} = \frac{(4/3)^2 \cdot 1}{(4/3) \cdot (8/3)} = \frac{1}{2}$$

• Finalmente:  $\ln \left( \frac{K_p(298)}{K_p(T_{\text{eq}})} \right) = \frac{\Delta H_{\text{rxn}}^{\circ}}{R} \left( \frac{1}{T_{\text{eq}}} - \frac{1}{298} \right)$

$\Delta H^{\circ} = -20290 \left[ \frac{\text{cal}}{\text{mol}} \right]$   
 $R = 1,987 \left[ \frac{\text{cal}}{\text{mol} \cdot \text{K}} \right]$   
 $K_p(298) = 0,5$   
 $K_p(T_{\text{eq}}) = 1,36 \times 10^{-4}$

$$\Rightarrow \boxed{T_{\text{eq}} = 240,4 \text{ [K]}}$$