Ex. 4.14

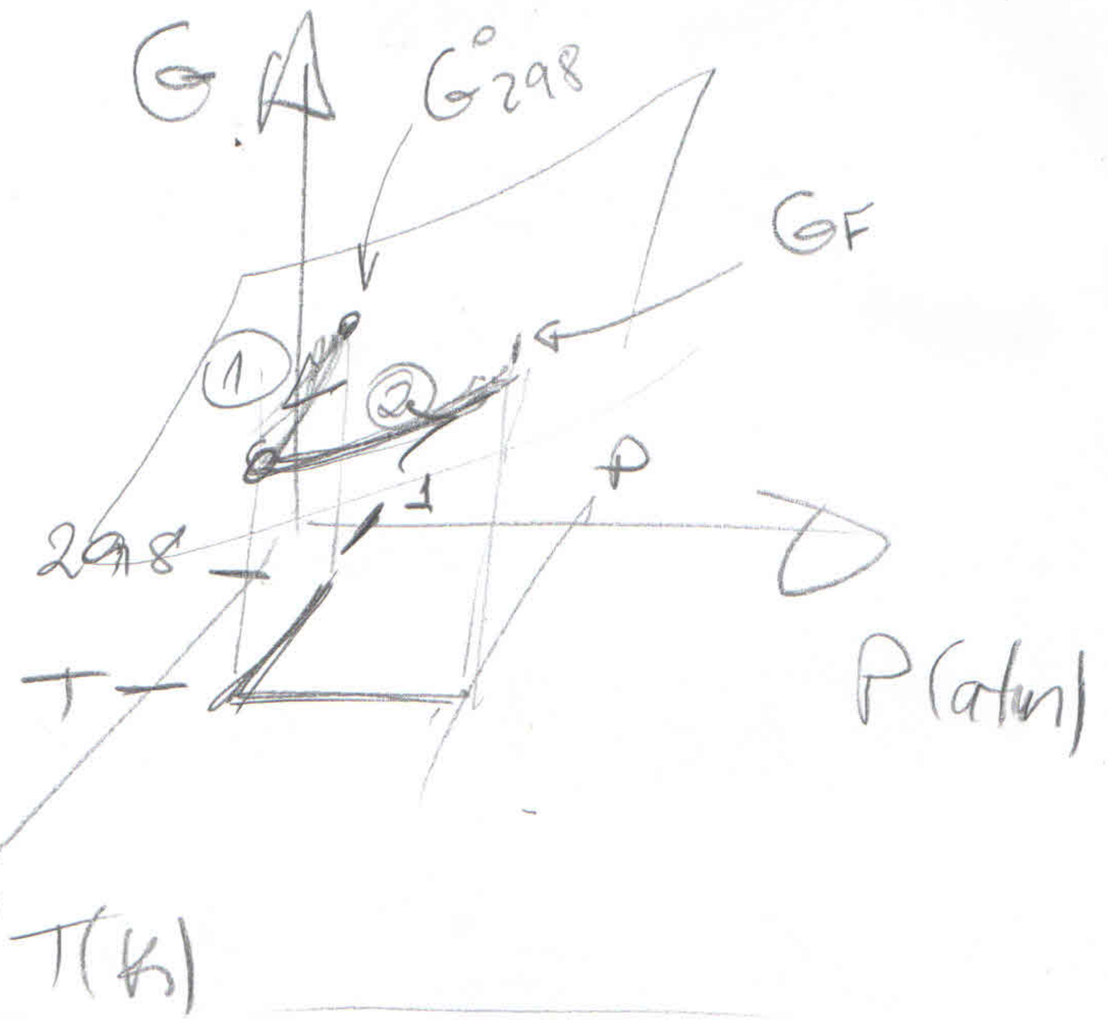
$$dG = -S\,dT + V\,dp$$

no caminho ①: $p = cte$, $dp = 0$

$$dG = -S\,dT$$

$$dS = \frac{C_p}{T}\,dT - V\alpha\,dp^{0}$$

$$dS = \frac{C_p}{T}\,dT$$



para um gás nobre diatômico (H_2)

$C_p = \frac{7}{2}R$ independente de T e p:

$PV = nRT$, mas considerando 1 mol

$PV = RT \rightarrow V = RT/p$ *

$$\int_{S^{\circ}_{298}}^{S} dS = \int_{298}^{T} \frac{C_p}{T}\,dT$$

$$\Delta S = S - S^{\circ}_{298} = C_p \cdot \ln\left(\frac{T}{298}\right)$$

$$S = S^{\circ}_{298} + C_p \ln\left(\frac{T}{298}\right)$$

$$dG = -\left[S^{\circ}_{298} + C_p \ln\left(\frac{T}{298}\right)\right] dT$$

$$\Delta G_1 = \int_{G^{\circ}_{298}}^{G'_T} dG = C_p\left(T - 298 - T\ln\left(\frac{T}{298}\right)\right) - S^{\circ}_{298}(T - 298)$$

No caminho ②: $T = cte$, $dT = 0$ *

$$\Delta G_2 = \left(G_G - G'_T\right) = -S\,dT + V\,dp \rightarrow$$

$$\Delta G_2 = \int V dp$$

$$PV = RT \rightarrow V = \frac{RT}{P}$$

$$\Delta G_2 = \int_{1atm}^{P} \frac{RT}{P} \cdot dp = RT \cdot \ln\left(\frac{P}{1atm}\right)$$

$$\Delta G_{Total} = \Delta G_1 + \Delta G_2 = \left(G_T - G^\circ_{298}\right) + \left(G_F - G_T\right) =$$

$$= \left| G_F - G^\circ_{298} = \frac{7}{2} R\left(T - 298 - T \cdot \ln\left(\frac{T}{298}\right)\right) - S^\circ_{298}(T-298) \right.$$

$$\left. + RT \ln\left(\frac{P}{1atm}\right) \right.$$