ex N° 2

1/ $P \to 0$

$GR \Rightarrow GP$

2/ $F = \phi P$ (ϕ depend de type de gaz)

3/ le calcule de ϕ à $P = 200$ atm et $T = 300$ k

$dG_m = -S\,dT + V_m\,dP$

à $T = cte$ donc $dT = 0$

$\boxed{dG_m = V_m\,dP}$

$G^P_m = G^0_m + RT \ln \frac{P}{P_0} \Rightarrow GP$ (1)

$G^R_m = G^0_m + RT \ln \frac{f}{f_0} \Rightarrow GR$ (2)

(2) − (1) => on trouve

$\Delta G_m = G^R_m - G^P_m + RT \ln \frac{P}{f}$

$\Delta G_m = RT \ln \frac{P}{f}$ $[f_0 = P_0]$

$\Delta G_m = RT \ln \phi$

$\ln \phi = \frac{\Delta G_m}{RT}$ ...... (*)

$\phi = e^{\Delta G/RT}$ ...... (*)

ou $\Delta G_m = G^R_m - G^P_m$

$= \int_{P_1}^{P_f} V^R_m\,dP - \int_{P_1}^{P_f} V_m\,dP$

$= \int_{P_1}^{P_2} (V^R_m - V^P_m)\,dP$

$= \int_0^P \left(V^R_m - \frac{RT}{P}\right) dP$

Pour les gaz réel on a

$PV^R = RT + BP + CP^2$

$V^R_m = \frac{RT}{P} - \frac{0{,}05P}{P} + \frac{2.10^{-5} P^2}{P}$

$= \frac{RT}{P} - 0{,}05 + 2.10^{-5} P$

donc ;

$\Delta G_m = \int_0^P \left(\cancel{\frac{RT}{P}} - 0{,}05 + 2.10^{-2} P - \cancel{\frac{RT}{P}}\right)$

$= \int (-0{,}05 + 2.10^{-2} P)\,dP$ ...

$\Delta G^0 = BP + CP^2$

on remplace dans l'eqt (*)

$\phi = e^{\frac{1}{RT}\left[-0{,}05P + 2.10^{-2}\frac{P^2}{2}\right]}$

donc à $P = 200$ atm

$T = 300$ K

$R = 0{,}082$ atm

$\phi = 0{,}676$

3/ $\phi = \frac{f}{P} \Rightarrow f = \phi P$

$\Rightarrow f = 0{,}676 \cdot 200$

$= f = 134$ atm

4/ $F = P \to \phi = 1$

donc $\phi = e^{1/RT\left[-0{,}005P + P^2 .10^{-2}\right]}$

$\Rightarrow 1 = e$