Corrigé type
D'examen de controle de 3ᵉᵐᵉ année
chimie fondamentale
*Module : chimie thermodynamique des
Solutions.*

08:00

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exercice N°1 (0,25)

1 - $PV = nRT \Rightarrow \dfrac{V}{n} = \dfrac{RT}{P}$ (0,25)

$\Rightarrow V_m = \dfrac{RT}{P}$ (0,25)

$\Rightarrow V_m = \dfrac{0,08206 \cdot 298}{0,987}$

$= 24,77 \; \ell/\text{mol}$ (0,25)

2 - $\ast \; U = Q + W \Rightarrow dU = dQ + dW$ (0,25)

$\Rightarrow dU = TdS - PdV$

$\Rightarrow \dfrac{dU}{n} = \dfrac{TdS}{n} - \dfrac{PdV}{n}$ (0,25)

$\Rightarrow dU_m = TdS_m - PdV_m$ (0,25)

$\ast \; H = U + PV \Rightarrow dH = dU + PdV + VdP$ (0,25)

$\Rightarrow dH = TdS - PdV + PdV + VdP$

$\Rightarrow dH = TdS + VdP$ (0,25)

$\Rightarrow \dfrac{dH}{n} = \dfrac{TdS}{n} + \dfrac{V}{n}dP$ (0,25)

$\Rightarrow dH_m = TdS_m + V_m dP$

$\ast \; F = U - TS \Rightarrow dF = dU - TdS - SdT$ (0,25)

$\Rightarrow dF = TdS - PdV - TdS - SdT$

$\Rightarrow dF = -PdV - SdT$ (0,25)

$\Rightarrow \dfrac{dF}{n} = -\dfrac{PdV}{n} - \dfrac{S}{n}dT$ (0,25)

$\Rightarrow dF_m = -PdV_m - S_m dT$

$\ast \; G = H - TS \Rightarrow dG = dH - TdS - SdT$ (0,25)

$\Rightarrow dG = TdS + VdP - TdS - SdT$

$\Rightarrow dG = VdP - SdT$ (0,25)

$\Rightarrow \dfrac{dG}{n} = \dfrac{V}{n}dP - \dfrac{S}{n}dT$ (0,25)

$\Rightarrow dG_m = V_m dP - S_m dT$

3 - $\left[\dfrac{\partial}{\partial T}\left(\dfrac{\mu_i}{T}\right)\right]_{P, n_i} = \dfrac{\dfrac{\partial \mu_i}{\partial T} \cdot T - \dfrac{\partial T}{\partial T} \mu_i}{T^2}$ (0,25)

$dG_i = d\mu_i = \underbrace{VdP}_{Pd\bar{e}} - SdT$ (0,25)

$d\mu_i = -SdT$ (0,25)

donc $\left[\dfrac{\partial}{\partial T}\left(\dfrac{\mu_i}{T}\right)\right]_{P, n_i} = \dfrac{-ST - \mu_i}{T^2}$ (0,25)

$\mu_i = G_i = H_i - TS$ (0,25)

$\dfrac{\partial}{\partial T}\left(\dfrac{\mu_i}{T}\right) = \dfrac{-ST - H_i + TS}{T^2}$ (0,25)

$\boxed{\left[\dfrac{\partial}{\partial T}\left(\dfrac{\mu_i}{T}\right)\right]_{P, n_i} = \dfrac{-H_i}{T^2}}$ (0,25)

suite de question 2.

*la relation de G, F, U, H
avec le potentiel chimique*

$dG = VdP - SdT + \mu^{\ast} dn$ (0,25)

$dF = -PdV - SdT + \mu^{\ast} dn$ (0,25)

$dH = TdS_m + V_m dP + \mu^{\ast} dn$ (0,25)

$dU = TdS - PdV + \mu^{\ast} dn$ (0,25)