corrigé type 2020/2021

Exo 1 (12pts)

1- $\Delta H_r^\circ = \Delta H_{f(H_2O,g)}^\circ + \Delta H_{f(SO_2,g)}^\circ - \Delta H_{f(H_2S,g)}^\circ - \frac{3}{2}\Delta H_{f(O_2,g)}^\circ$ (1)

$= -241,83 - 296,9 + 20,15$

$\Delta H_r^\circ = -518,58$ kJ / mol (0,5)

2- $\Delta S_r^\circ = S_{(H_2O,g)}^\circ + S_{(SO_2,g)}^\circ - S_{(H_2S,g)}^\circ - \frac{3}{2} S_{(O_2,g)}^\circ$ (1)

$= 188,8 + 248,2 - 205,8 - \frac{3}{2} \times 205,1$

$\Delta S_r^\circ = -76,45$ J / k.mol (0,5)

3- $\Delta G_{r,800k}^\circ = \Delta H_{r,800k}^\circ - 800\, \Delta S_{R,800k}^\circ$ (1)

* $\Delta H_{r,800k}^\circ = \Delta H_{r,298}^\circ + \int_{298}^{800} \Delta C_p^\circ \cdot dT$ (1)

$\Delta C_p^\circ = C_{p(H_2O,g)}^\circ + C_{p(SO_2,g)}^\circ - C_{p(H_2S,g)}^\circ - \frac{3}{2} C_{p(O_2,g)}^\circ$ (1)

(0,5) $= -9,04 + 25,56.10^{-3} T - 25,53.10^{-6} T^{-2}$

$\Delta H_{r,800k}^\circ = -518,58 \times 10^3 + \int_{298}^{800} \left(-9,04 + 25,56.10^{-3} T - 25,53.10^{-6} T^{-2}\right) dT$

(1) $= -518,58.10^3 - 9,04(800-298) + \frac{25,56.10^{-3}}{2}(800^2 - 298^2) - \frac{25,53.10^{-6}}{3}(800^3 - 298^3)$

$\Delta H_{f\,800k}^\circ = -518,58.10^3 - 2177$

$= -520,75$ kJ / mol (0,5)

* $\Delta S_{R,800k}^\circ = \Delta S_{298}^\circ + \int_{298}^{800} \Delta C_p^\circ \cdot \frac{dT}{T}$ (1)

$\int_{298}^{800} \Delta C_p^\circ \cdot \frac{dT}{T} = \int \frac{-9,04}{T} dT + 25,56.10^{-3} dT - 25,53.10^{-6} . T . dT$ (1)

(1) $= -9,04 \ln \frac{800}{298} + 25,56.10^{-3}(800-298) - \frac{25,35.10^{-6}}{2}(800^2 - 298^2)$

$= -8,927 + 12,831 - 6,886$

$= -3,082$ J / k.mol

(0,5)