Correction of the Thermodynamics and Chemistry Solution

Exo1/ = 6 points

① exp ① and ④ =

$$\begin{cases} r_1 = 0,6\,10^{-2} = k(0,1)^{\alpha}(0,1)^{\beta} \quad --- ① \\ r_4 = 2,40\,10^{-2} = k(0,4)^{\alpha}(0,1)^{\beta} \quad --- ④ \end{cases}$$

OW

$$\frac{④}{①} \Rightarrow \frac{2,40}{0,6} = \left(\frac{0,4}{0,1}\right)^{\beta} \rightarrow 4 = 4^{\alpha} \Rightarrow \boxed{\alpha = 1}$$

OW OW

② exp ② and ③ =

$$\begin{cases} r_2 = 7,2\,10^{-2} = k(0,3)^{\alpha}(0,2)^{\beta} \quad --- ② \\ r_3 = 28,8\,10^{-2} = k(0,3)^{\alpha}(0,4)^{\beta} \quad --- ③ \end{cases}$$

OW

$$\frac{③}{②} \Rightarrow \frac{28,8}{7,2} = \left(\frac{0,4}{0,2}\right)^{\beta} \Rightarrow 4 = 2^{\beta} \Rightarrow \boxed{\beta = 2}$$

OW OW

③ $n = \alpha + \beta = 1 + 2 = 3$ OW

④ $r = k[A][B]^2$ OW OW

⑤ exp 1: $k = \dfrac{r_0}{[A]_0[B]_0^2} = \dfrac{0,6 \cdot 10^{-2}}{(0,1)(0,1)^2}$ OW

$k = 6$ $mol^{-2}\,l^{+2}\,s^{-1}$ OW OW

Exo2/ - 04 points

$CO_2 + 2H_2O \longrightarrow CH_4 + 2O_2$ ---- $-\Delta H_1^\circ$ OW

$C + O_2 \longrightarrow CO_2$ ---- ΔH_2° OW

$2H_2 + O_2 \longrightarrow 2H_2O$ ---- $2\Delta H_3^\circ$ OW

$C + 2H_2 \longrightarrow CH_4$ ---- ΔH_R°

$\Delta H_R^\circ = -\Delta H_1 + \Delta H_2 + 2\Delta H_3$ 01

$= 89,3 + (-393,5) + 2(-241,8)$ OW

$= 13,2\ KJ$ 01

/EX03/ : 6 points

① $pH = \frac{1}{2}(pK_a - \log c) \Rightarrow pK_a = 2pH + \log c$ 0,5 + 0,5

$pK_a = 6 - \log 2 \Rightarrow \boxed{K_a = 2 \times 10^{-6}}$ 0,5

② $pH = \frac{1}{2}(pK_a - \log c)$ with : $pK_a = -\log 5,8\,10^{-10} = 9,23$ 0,5 + 0,5

$pH = \frac{1}{2}(9,23 - \log 846) = 4,15$ 0,5 + 0,5

③ HF stronger than H_3BO_3 because $K_a(HF) > K_a(H_3BO_3)$ 0,5

or : $pK_a(HF) < pK_a(H_3BO_3)$ 0,5

(5,69) (9,23)

④ $HF \longrightarrow F^-$ 0,5

$H_3BO_3 \longrightarrow H_2BO_3^-$ 0,5

/EX04/ 4 points

$2MnO_4^- + 5SO_3^{-2} + 6H^+ \longrightarrow 5SO_4^{2-} + 2Mn^{2+} + 3H_2O$ 0,25 × 6

MnO_4^- : +7 ; SO_3^{-2} : +4 ; SO_4^{2-} : +6 ; Mn^{2+} : +2 0,25 × 4

$(SO_3 \longrightarrow SO_4^{2-} + 2e^-) \times 5$ 0,25

$(MnO_4^- + 5e^- \longrightarrow Mn^{2+}) \times 2$ 0,25