

EX03 = 05 pts

1 HBr = acide forte:  $pH = -\log c \Rightarrow pH = -\log 10^{-1} = 1$

$[H_3O^+] = c = 0,1 \text{ mol.l}^{-1}$

2 KOH = base forte:  $pH = 14 + \log c = 14 + \log 0,5$

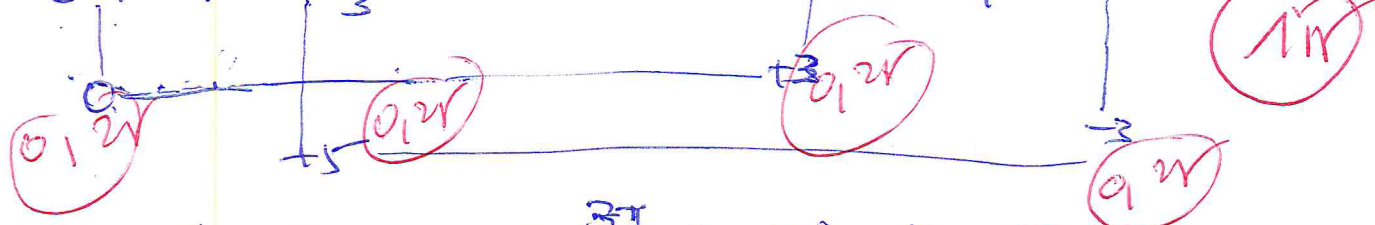
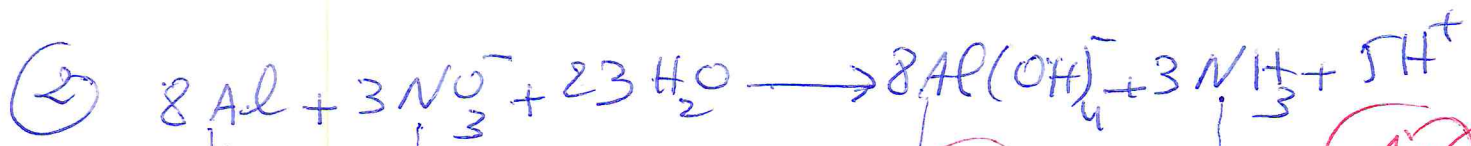
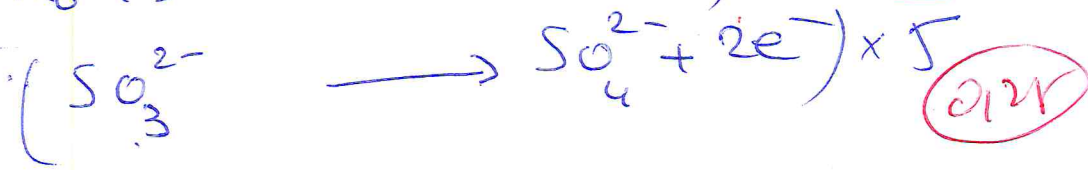
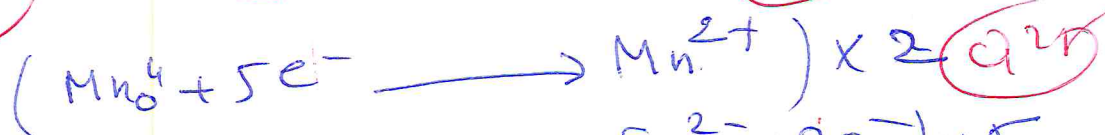
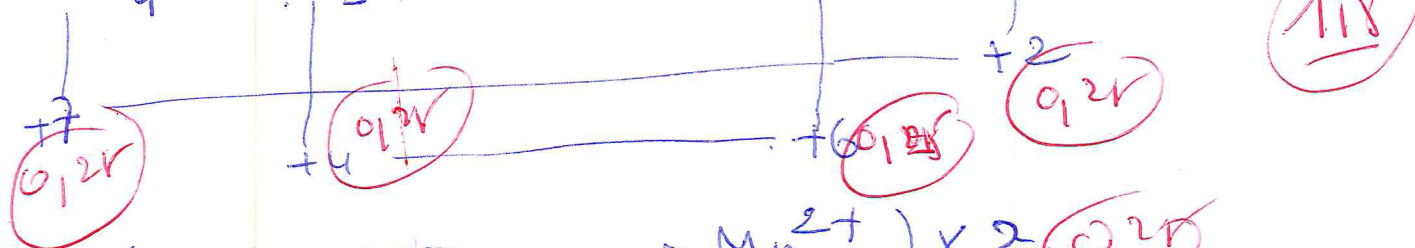
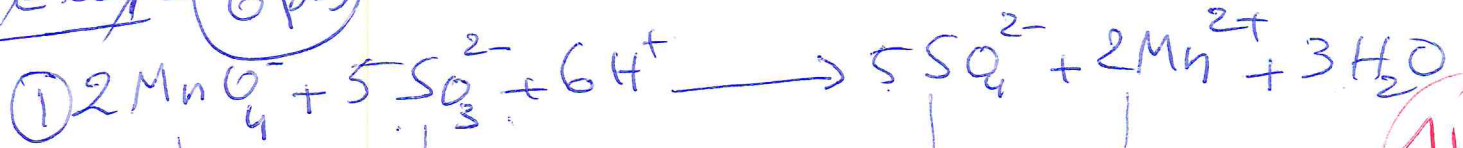
$pH = 13,7$

$[H_3O^+] = 10^{-pH} = 10^{-13,7} = 2 \cdot 10^{-14} \text{ mol.l}^{-1}$

3  $HNO_3$ : acide fort -  $[H_3O^+] = 10^{-pH} = 10^{-2,75} = 1,77 \cdot 10^{-3} \text{ mol.l}^{-1}$

$[HNO_3] = [H_3O^+] = 1,77 \cdot 10^{-3}$

EX04 = 6 pts



Exo 1 = (5.15 pts) La conation de l'exo de Thermodynamique

① exp ① et ② =  $[H_2]_0 = \text{ct}$  et  $[NO]_0 = 3[NO]_0$

$$\begin{cases} v_{01} = k [NO]_0^\alpha [H_2]_0^\beta \dots \text{--- (1)} \\ v_{02} = 9v_{01} = k (3[NO]_0)^\alpha (2[H_2]_0)^\beta \dots \text{--- (2)} \end{cases}$$

②  $\Rightarrow 9 = 3^\alpha \Rightarrow \alpha = 2$

② exp ② et ③ =  $[NO]_0 = \text{ct}$  et  $[H_2]_0 = 2[H_2]_0$

$$\begin{cases} v_{02} = k [NO]_0^\alpha [H_2]_0^\beta \dots \text{--- (1)} \\ v_{03} = 2v_{02} = k [NO]_0^\alpha (2[H_2]_0)^\beta \dots \text{--- (2)} \end{cases}$$

③  $n = \alpha + \beta = 1 + 2 = 3$

④  $v = k [NO]^2 [H_2]$

⑤ exp 1:  $k = \frac{v_0}{[NO]_0^2 [H_2]_0} = \frac{2.44 \cdot 10^{-5}}{(5 \cdot 10^{-3})^2 (2 \cdot 10^{-3})} = 4.88 \cdot 10^2 \text{ mol}^{-2} \cdot \text{s}^{-1}$

Exo 2 / (5.5 pts)

①  $\Delta H_{298}^\circ = \sum \Delta H_{f(\text{prod})}^\circ - \sum \Delta H_{f(\text{react})}^\circ$

$$\Delta H_{298}^\circ = (\Delta H_{f(\text{CO}_2)}^\circ + 4 \Delta H_{f(\text{H}_2\text{O})}^\circ) - (\Delta H_{f(\text{C}_2\text{H}_6)}^\circ + 4 \Delta H_{f(\text{O}_2)}^\circ)$$

$$= [-106.48 + 4(-92.3)] - (-74.6) = -401.08 \text{ kJ mol}^{-1}$$

②  $\Delta H_f < 0 \Rightarrow$  la rxn est exothermique

③ d'après la loi de Kirchhoff =

$$\frac{d\Delta H}{dT} = \Delta C_p \quad \Delta H_{T+\Delta T} = \Delta H_T + \Delta C_p \Delta T$$

$$\Delta H_{650} = \Delta H_{298} + \Delta C_p (650 - 298) \quad \text{et} \quad \Delta C_p = \sum C_{p(\text{prod})} - \sum C_{p(\text{react})}$$

$$\Delta C_p = (C_{p(\text{CO}_2)} + 4 C_{p(\text{H}_2\text{O})}) - (C_{p(\text{C}_2\text{H}_6)} + 4 C_{p(\text{O}_2)}) = 28.56 \text{ J K}^{-1} \text{ mol}^{-1}$$

$$\Delta H_{650} = -401.08 \cdot 10^3 + 28.56 (650 - 298) = -391.03 \text{ kJ mol}^{-1}$$