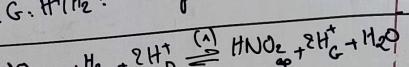
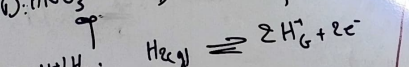
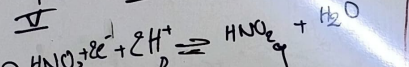
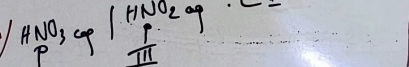
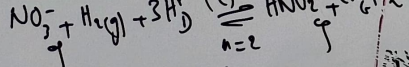
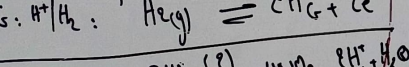
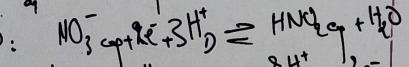
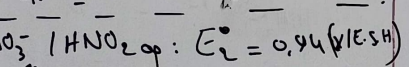


Exm. 2 $\Delta_r G^\circ = -nFE^\circ$

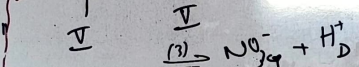
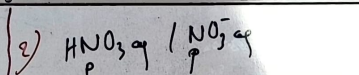
$F = 96485 \text{ C mol}^{-1}$



$\Delta_r G^\circ = -2FE^\circ$



$\Delta_r G^\circ = -2FE^\circ$



$\Delta_r G^\circ = -RT \ln K_a$

$(3) = 1(1) - 1(2)$

$\Delta_r G^\circ = \Delta_r G^\circ_1 - \Delta_r G^\circ_2$

$-RT \ln K_a = -2FE^\circ_1 + 2FE^\circ_2$

$\frac{RT}{F} \ln K_a = 2(E^\circ_1 - E^\circ_2)$

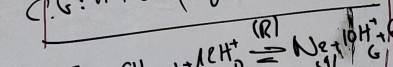
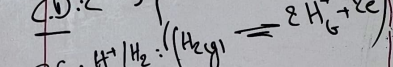
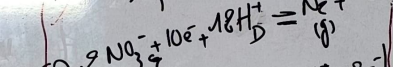
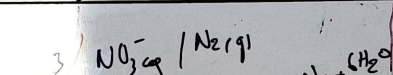
$0.06 \log K_a = 2(E^\circ_1 - E^\circ_2)$

$K_a(298) = 10^{\frac{2(0.98-0.94)}{0.06}}$

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$K_a(298) = 2154 ; pK_a = -1.33$

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$\Delta_r G^\circ = -10F E^\circ_{\text{NO}_3^- / \text{N}_2}$

$E^\circ_{\text{NO}_3^- / \text{N}_2} = -\frac{\Delta_r G^\circ}{10F}$

$E^\circ_{\text{NO}_3^- / \text{N}_2} = -\frac{\Delta_r G^\circ}{10F}$

$E^\circ_{\text{NO}_3^- / \text{N}_2} = -\frac{[2\text{NO}_3^-] - 2[\text{H}^+] + 6[\text{H}_2\text{O}] - 2[\text{N}_2] - 6[\text{H}_2]}{10F}$

$E^\circ_{\text{NO}_3^- / \text{N}_2} = -\frac{2(-110.9) - 6(-237.2)}{10(96485)}$

$E^\circ_{\text{NO}_3^- / \text{N}_2} = 1.24$

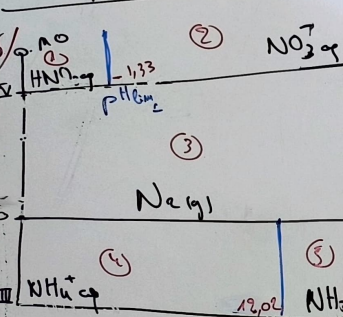
$E^\circ_{\text{NO}_3^- / \text{N}_2} = 1.24$

$E^\circ_{\text{NO}_3^- / \text{N}_2} = 1.24$

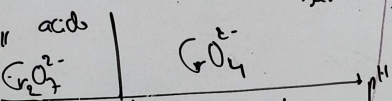
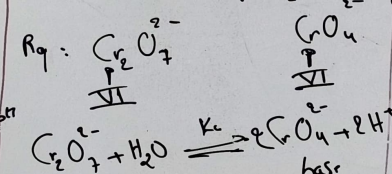
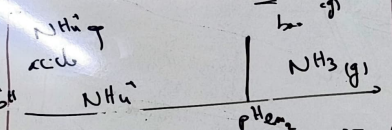
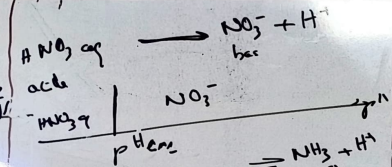
$1 \text{ C} = 1 \text{ V} \Rightarrow 1 \text{ J} = 1 \text{ C} \times 1 \text{ V}$

Ex m. 2 $\Delta G^\circ = -nFE^\circ$
 $\sum m.o = \text{charge totale}$

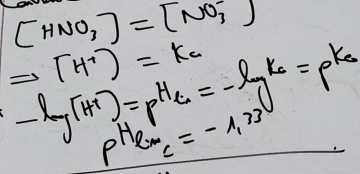
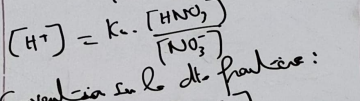
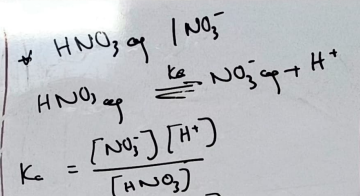
4/espèce	HNO_3	NO_3^-	NH_4^+	NH_3 (g)	N_2 (g)
n.o	V	V	-III	-III	0



pH; le charge de l'espèce ↓



Convention sur la dt. fraction:
 $\begin{cases} 2[\text{Cr}_2\text{O}_7^{2-}] = [\text{CrO}_4^{2-}] \\ 2[\text{Cr}_2\text{O}_7^{2-}] + [\text{CrO}_4^{2-}] = C_{\text{Tot}} \end{cases}$



Convention sur la dt. fraction:
 $\begin{cases} 2[\text{Cr}_2\text{O}_7^{2-}] = [\text{CrO}_4^{2-}] \\ 2[\text{Cr}_2\text{O}_7^{2-}] + [\text{CrO}_4^{2-}] = C_{\text{Tot}} \end{cases}$

$[\text{H}^+] = K^\circ \frac{[\text{NH}_4^+]}{\frac{p_{\text{NH}_3}}{p^\circ}}$
 Convention sur la dt. fraction: $\begin{cases} [\text{NH}_4^+] = C_{\text{Tot}} \\ p_{\text{NH}_3} = p^\circ \end{cases}$
 $[\text{H}^+] = K^\circ (C_{\text{Tot}} = 9.55 \cdot 10^{-12} \cdot 10^{-4})$
 $[\text{H}^+] = 9.11 \cdot 10^{-13} \Rightarrow pK_{a2} = -\log 9.11 \cdot 10^{-13}$
 $pK_{a2} = 12.02$

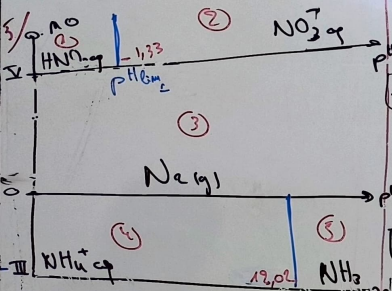
6/ Couple ox/red:
 $\text{HNO}_3 \text{ (aq)} / \text{N}_2 \text{ (g)} ; \text{NO}_3^- \text{ (aq)} / \text{N}_2 \text{ (g)}$
 $\text{N}_2 \text{ (g)} / \text{NH}_4^+ \text{ (aq)} ; \text{N}_2 \text{ (g)} / \text{NH}_3 \text{ (g)}$

7/ Par identification:
 domaine (1): $\text{HNO}_3 \text{ (aq)}$
 domaine (2): $\text{NO}_3^- \text{ (aq)}$
 domaine (3): $\text{N}_2 \text{ (g)}$
 domaine (4): $\text{NH}_4^+ \text{ (aq)}$
 domaine (5): $\text{NH}_3 \text{ (g)}$

Ex n° 2 $\Delta_r G^\circ = -nFE^\circ$
 $\sum m.o = \text{charge totale}$

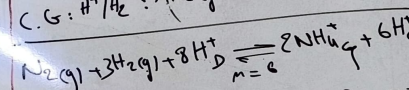
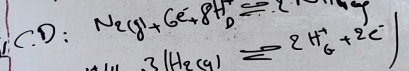
4/ espèce

n.o	V	V	-III	-III	0
	HNO_3	NO_3^-	NH_4^+	NH_3	N_2



pH? le charge de l'espèce & pH_{eq}

8/ partiene $\propto 1 \text{ Red}$: ③ ④: $\text{N}_2(g) | \text{NH}_4^+(aq)$



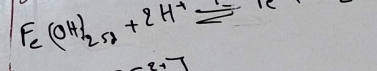
$$E(\text{NIE-S.H}) = E^\circ(\text{NIE-S.H}) + \frac{0.06}{6} \log \frac{P_{\text{N}_2} \cdot [\text{H}^+]^8}{[\text{NH}_4^+]^2}$$

Convention sur la dlo partien ③ ④
 $P_{\text{N}_2} = P^\circ$; $[\text{NH}_4^+] = C_{\text{Tn}}$

$$E(\text{NIE-S.H}) = E^\circ(\text{NIE-S.H}) - 0.08 \log C_{\text{Tn}} - 0.08 \text{pH}$$

$$E(\text{NIE-S.H}) = 0.295 - 0.08 \text{pH}$$

9/ $\text{Fe}^{2+} | \text{Fe}(\text{OH})_2 \text{ sd}$



$$K = \frac{[\text{Fe}^{2+}]}{[\text{H}^+]^2}$$

$$[\text{H}^+] = \left(\frac{[\text{Fe}^{2+}]}{K} \right)^{1/2} = \left(\frac{C_{\text{Tn}}}{K} \right)^{1/2}$$

Convention: $[\text{Fe}^{2+}] = C_{\text{Tn}}$

$$-\log[\text{H}^+] = -\frac{1}{2} (\log C_{\text{Tn}} - \log K)$$

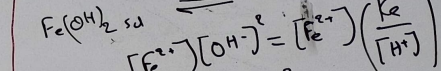
$$\text{pH}_{eq} = -\frac{1}{2} (\log C_{\text{Tn}} + \text{p}K)$$

AN..

$$\text{pH}_{eq} = -\frac{1}{2} (-1 - 13.27)$$

$$\text{pH}_{eq} = 7.135$$

10/ $\text{Fe}(\text{OH})_2$



$$K_s = [\text{Fe}^{2+}][\text{OH}^-]^2 = [\text{Fe}^{2+}] \left(\frac{K_e}{[\text{H}^+]} \right)^2$$

$$K_s = C_{\text{Tn}} \cdot \left(\frac{10^{-14}}{10^{-\text{pH}_{eq}}} \right)^2$$

$$K_s = C_{\text{Tn}} 10^{2(\text{pH}_{eq} - 14)}$$

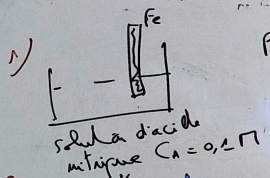
AN..

$$K_s = 10^{-14}$$

$$K_{s(295)} = 1.86 \cdot 10^{-14}$$

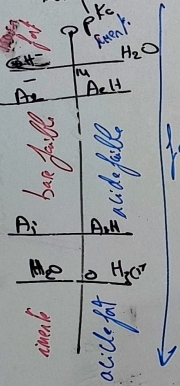
$$\text{pH}_{eq} = \text{p}K_e - \frac{1}{2} (\log C_{\text{Tn}} + \text{p}K_s)$$

face d'oxygène

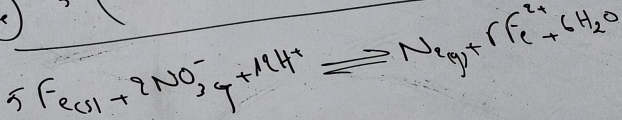
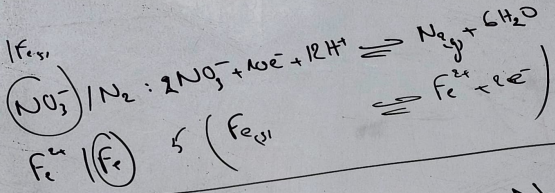
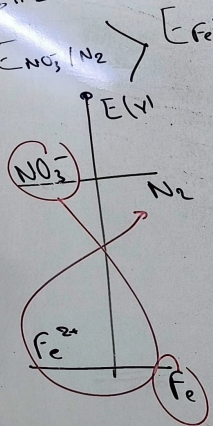


$pK_a(HNO_3/HNO_2) = -1,33 < 0$
(HNO_3): acide fort)

$pH = -\log C$
 $pH = 1$



face d'oxygène
augmenté



Zinnmer S-L ($H_2SO_4 - SO_3$) $n_{SO_3} = 80 \text{ g mol}^{-1}$
 $n_{H_2SO_4} = 98 \text{ g mol}^{-1}$

$$C: (H_2SO_4)_u (SO_3)_v$$

$$w_{SO_3}^C = 0,4r = \frac{v n_{SO_3}}{u n_{H_2SO_4} + v n_{SO_3}}$$

$$w_{H_2SO_4}^C = 0,rr = \frac{u n_{H_2SO_4}}{u n_{H_2SO_4} + v n_{SO_3}}$$

$$\frac{w_{H_2SO_4}^C}{w_{SO_3}^C} = \frac{0,rr}{0,4r} = \left(\frac{u}{v} \right) \cdot \frac{n_{H_2SO_4}}{n_{SO_3}}$$

$$\frac{u}{v} = \frac{w_{H_2SO_4}^C}{w_{SO_3}^C} \cdot \frac{n_{SO_3}}{n_{H_2SO_4}} = \frac{0,rr}{0,4r} \cdot \frac{80}{98} = 1 = \frac{1}{1}$$

$u=1$
 $v=1$
 $C: (H_2SO_4)_1 (SO_3)_1$

$E_1: (w_{SO_3}^{L,E_1} = 0,19; T_{E_1} = -10^\circ C)$
 $liq(E_1: w_{SO_3} = 0,19) \rightleftharpoons H_2SO_4 + C_{sd}$
 $E_2: (w_{SO_3}^{L,E_2} = 0,6; T_{E_2} = 9,7^\circ C)$
 $a T_{E_2}: \text{Transf eutectiq.}$
 $liq(E_2: w_{SO_3} = 0,6) \rightleftharpoons C_{sd} + SO_{3sd}$

