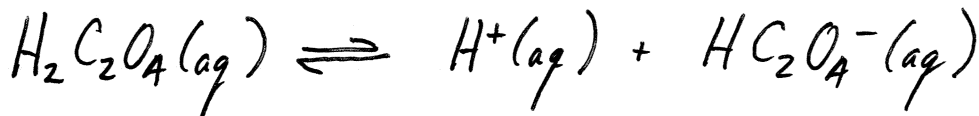




les pKa's ont deux chiffres significatifs, donc nos réponses finales auront deux aussi (au plus)

b) $K_{a1} = 10^{-1.19} = 6.46 \times 10^{-2}$; $K_{a2} = 10^{-4.21} = 6.17 \times 10^{-5}$



i:	0.16	-	-
c:	-x	+x	+x
e:	0.16-x	x	x

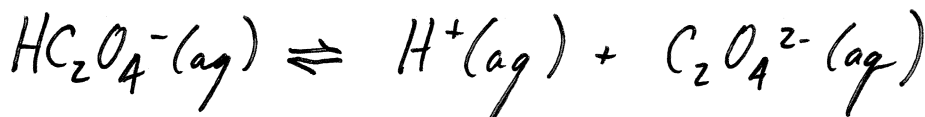
⇒ si on fait l'approximation $0.16 - x \approx 0.16$, on trouvera $x > 5\%$ de 0.16

$$6.46 \times 10^{-2} = \frac{[\text{H}^+][\text{HC}_2\text{O}_4^-]}{[\text{H}_2\text{C}_2\text{O}_4]} = \frac{(x)(x)}{0.16 - x}$$

$$x^2 + 6.46 \times 10^{-2} x - 0.010336 = 0$$

$$x = [\text{H}^+] = [\text{HC}_2\text{O}_4^-] = 0.0744$$

$$[\text{HC}_2\text{O}_4^-] = 0.16 - x = \underline{\underline{0.09 \text{ M}}}$$

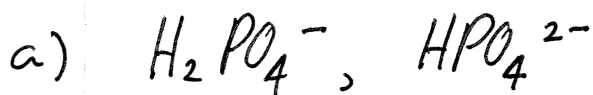


i:	0.0744	0.0744	-
c:	-x	+x	+x
e:	0.0744-x ≈ 0.0744	0.0744+x ≈ 0.0744	x

$$6.17 \times 10^{-5} = \frac{[\text{H}^+][\text{C}_2\text{O}_4^{2-}]}{[\text{HC}_2\text{O}_4^-]} = \frac{(0.0744)(x)}{(0.0744)}$$

$$x = [\text{C}_2\text{O}_4^{2-}] = 6.17 \times 10^{-5} \text{ (approximation est bonne)}$$

$$[\text{H}^+] = \underline{\underline{0.074 \text{ M}}} ; [\text{HC}_2\text{O}_4^-] = \underline{\underline{0.074 \text{ M}}} ; [\text{C}_2\text{O}_4^{2-}] = \underline{\underline{6.2 \times 10^{-5} \text{ M}}}$$



b) le $\text{Ba}(\text{OH})_2$ a deux groupes OH^- , donc

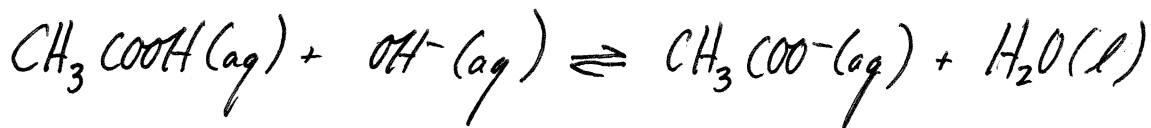
$$C_A V_A = 2 C_B V_B$$

$$V_A = \frac{2 C_B V_B}{C_A} = \frac{(2)(0.233)(44.0)}{(0.511)} = \underline{\underline{40.1 \text{ mL}}}$$

• calculer les moles de CH_3COOH et de OH^- après l'ajout de 20.0 mL

$$\begin{aligned} n_{\text{CH}_3\text{COOH}} &= (0.511 \text{ mol/L})(0.0200 \text{ L}) \\ &= 0.01022 \text{ mol} \end{aligned}$$

$$\begin{aligned} n_{\text{OH}^-} &= (2)(0.233 \text{ mol/L})(0.0440 \text{ L}) \\ &= 0.02054 \text{ mol} \end{aligned}$$



i:	0.01022	0.02054	-
c:	-0.01022	-0.01022	+0.01022
e:	-	0.01032 mol	0.01022 mol

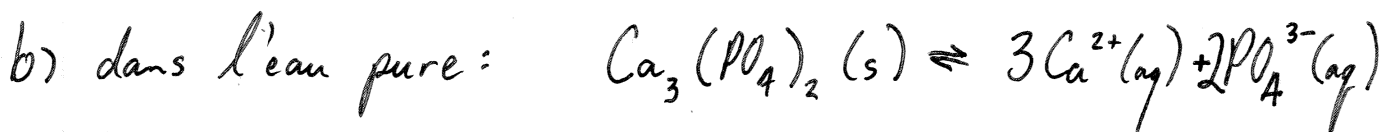
⇒ le pOH est déterminé par le OH^- qui est toujours en excès

$$[\text{OH}^-] = \frac{0.01032 \text{ mol}}{(0.0440 + 0.0200) \text{ L}} = 0.161 \text{ M}$$

$$\text{pOH} = -\log(0.161) = 0.792$$

$$\text{pH} = 14.00 - 0.792 = \underline{\underline{13.21}}$$

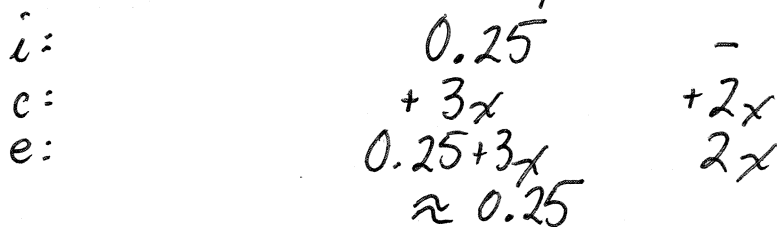
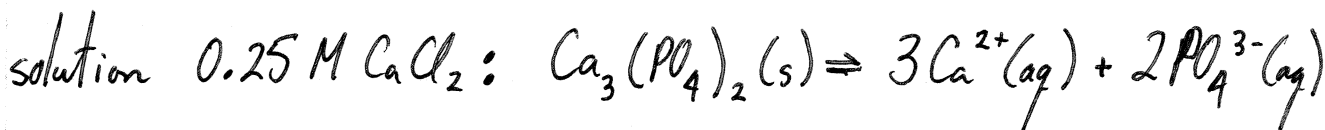
a) zéro



$$K_{ps} = [\text{Ca}^{2+}]^3 [\text{PO}_4^{3-}]^2 \Rightarrow 2.1 \times 10^{-33} = (3x)^3 (2x)^2 = 108x^5$$

$$x = \sqrt[5]{\frac{2.1 \times 10^{-33}}{108}} = 1.14 \times 10^{-7}$$

$$\begin{aligned} \text{solubilité} &= (1.14 \times 10^{-7} \text{ mol/L}) [3 \times 40.08 + 2 \times 30.97 + 8 \times 16.00] \text{ g/mol} \\ &= \underline{\underline{3.5 \times 10^{-5} \text{ g/L}}} \end{aligned}$$

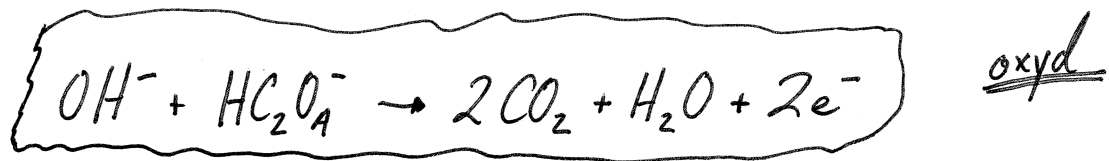
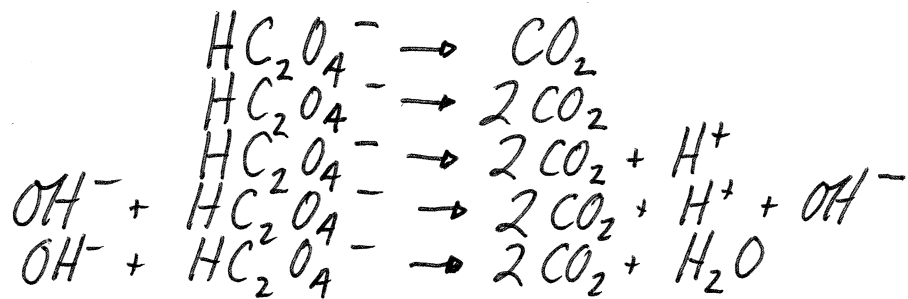
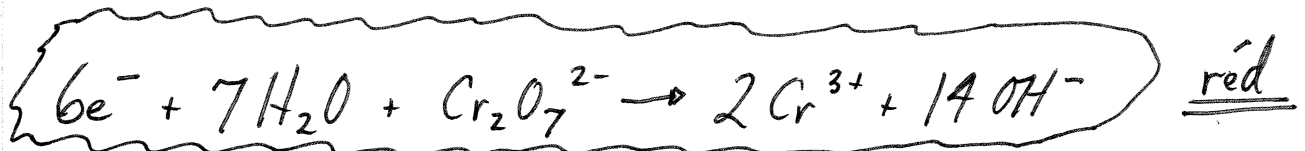
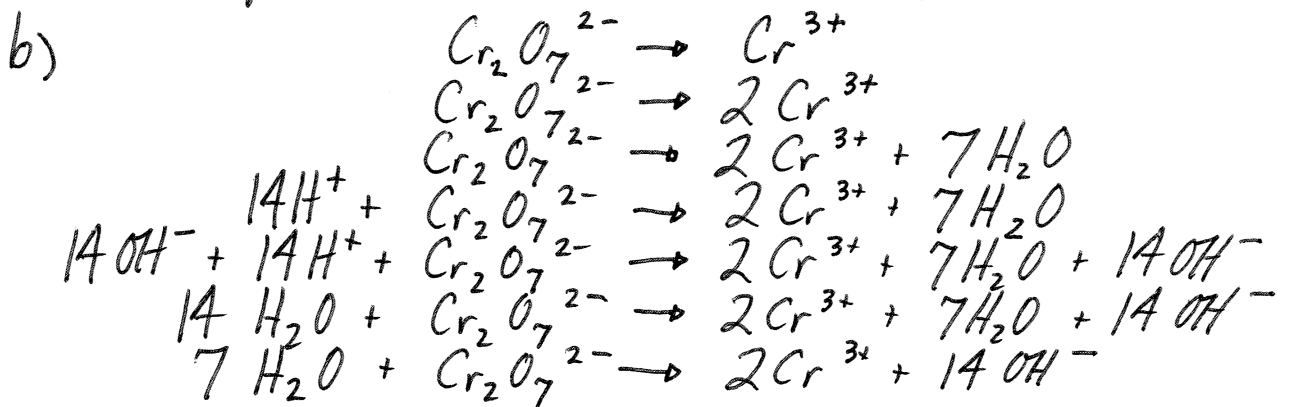


$$K_{ps} = [\text{Ca}^{2+}]^3 [\text{PO}_4^{3-}]^2 \Rightarrow 2.1 \times 10^{-33} = (0.25)^3 (2x)^2$$

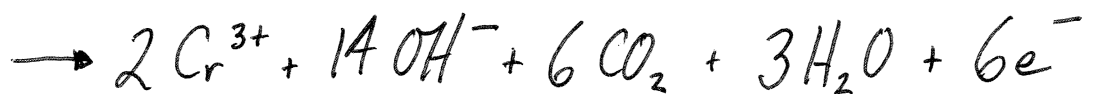
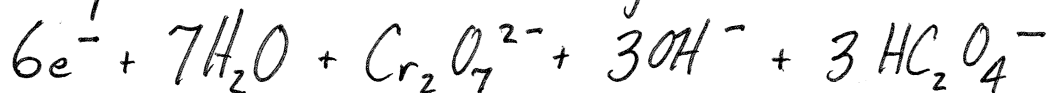
$$x = \sqrt{\frac{2.1 \times 10^{-33}}{(0.25)^3 (4)}} = 1.83 \times 10^{-16}$$

$$\begin{aligned} \text{solubilité} &= (1.83 \times 10^{-16} \text{ mol/L}) [3 \times 40.08 + 2 \times 30.97 + 8 \times 16.00] \text{ g/mol} \\ &= \underline{\underline{5.7 \times 10^{-14} \text{ g/L}}} \end{aligned}$$

a) les réponses (a) et (d) sont possibles

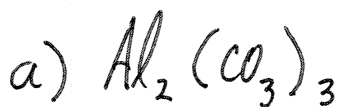


⇒ pour avoir le même nombre d'électrons dans chaque demi-réaction, ajoutez réd + 3* oxyd



⇒ simplifiez autant que possible :





b) calculez le nombre de moles de $\text{Cd}(\text{NO}_3)_2$

$$8.88 \text{ g} / (112.41 + 2 * 14.01 + 6 * 16.00) \text{ g/mol} = 0.037559 \text{ mol}$$

\Rightarrow on a 1.00L, donc $[\text{Cd}^{2+}] = 0.037559 \text{ M}$



$i:$	0.037559	0.95	-
$c:$	-0.037559	$-0.037559 * 4$	+0.037559
$e:$	-	0.799764	0.037559

• imagine qu'une petite quantité " x " retourne pour donner un peu de $\text{Cd}^{2+}(\text{aq})$

$$[\text{Cd}(\text{CN})_4^{2-}] = 0.037559 - x \approx 0.037559$$

$$[\text{CN}^{-}] = 0.799764 + 4x \approx 0.799764$$

• calculez $[\text{Cd}^{2+}]$ avec K_f

$$K_f = \frac{[\text{Cd}(\text{CN})_4^{2-}]}{[\text{Cd}^{2+}][\text{CN}^{-}]^4} \Rightarrow [\text{Cd}^{2+}] = \frac{[\text{Cd}(\text{CN})_4^{2-}]}{K_f [\text{CN}^{-}]^4}$$

$$[\text{Cd}^{2+}] = \frac{(0.037559)}{(7.1 \times 10^{16})(0.799764)^4} = 1.29 \times 10^{-18}$$

• pour les chiffres significatifs, N.B. que $[\text{Cd}(\text{CN})_4^{2-}]$ n'a utilisé que des données avec trois chiffres significatifs, donc

$$[\text{Cd}^{2+}] = \underline{\underline{1.3 \times 10^{-18} \text{ M}}}$$

$$[\text{Cd}(\text{CN})_4^{2-}] = \underline{\underline{0.0376 \text{ M}}}$$

$$[\text{CN}^{-}] = \underline{\underline{0.80 \text{ M}}}$$