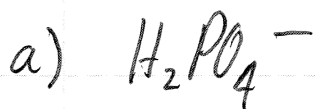
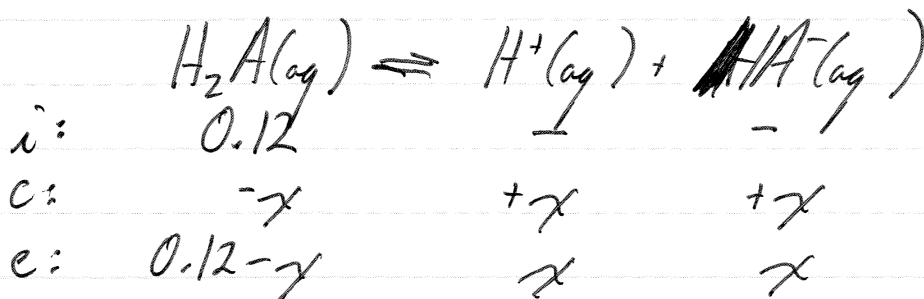


W.B que les pKa's sont précis à deux chiffres significatifs



b) $K_{a1} = 10^{-1.33} = 0.0468$; $K_{a2} = 10^{-5.77} = 1.70 \times 10^{-6}$

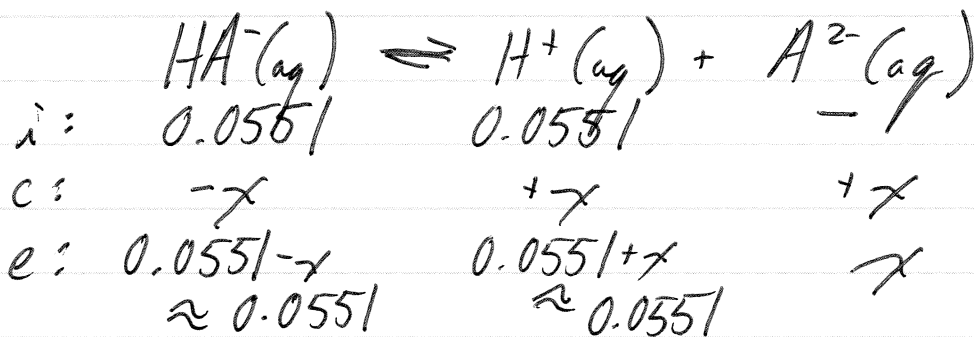


\Rightarrow si on fait l'approximation $0.12 - x \approx 0.12$, on trouvera $x > 5\%$ de 0.12

$$K_{a1} = 0.0468 = \frac{[\text{H}^+][\text{HA}^-]}{[\text{H}_2\text{A}]} = \frac{(x)(x)}{0.12-x}$$

$$x^2 + 0.0468x - 0.005616 = 0 \Rightarrow x = [\text{H}^+] = [\text{HA}^-] = 0.0551 \text{ M}$$

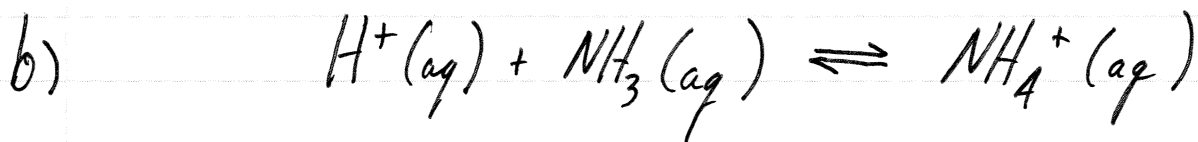
$$[\text{H}_2\text{A}] = 0.12 - x = \underline{0.06 \text{ M}}$$



$$K_{a2} = 1.70 \times 10^{-6} = \frac{[\text{H}^+][\text{A}^{2-}]}{[\text{HA}^-]} = \frac{(0.0551)(x)}{(0.0551)}$$

$$x = 1.70 \times 10^{-6} \Rightarrow [\text{H}^+] = \underline{0.055 \text{ M}} ; [\text{HA}^-] = \underline{0.055 \text{ M}}$$

$$[\text{A}^{2-}] = \underline{1.7 \times 10^{-6} \text{ M}}$$



i:	0.280 mol	0.500 mol	-
c:	-0.280 mol	-0.280 mol	+0.280 mol
e:	-	0.220 mol	0.280 mol

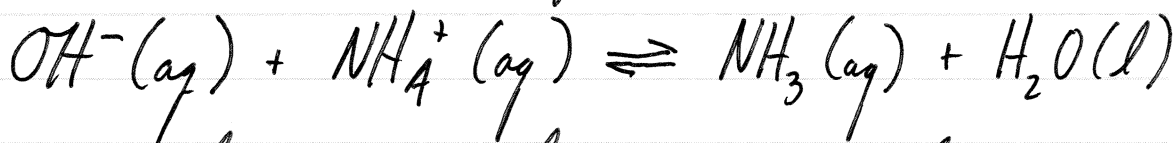
$$\text{pH} = \text{pK}_a + \log \left(\frac{[\text{NH}_3]}{[\text{NH}_4^+]}\right)$$

$$\text{pH} = -\log(5.5 \times 10^{-10}) + \log \left(\frac{0.220 \text{ mol} / 2.000 \text{ L}}{0.280 \text{ mol} / 2.000 \text{ L}} \right)$$

$$\text{pH} = \underline{\underline{9.15}}$$

⇒ calculer le nombre de moles de NaOH qu'on a ajouté

$$1.11 \text{ g} / (22.99 + 16.00 + 1.008) \text{ g/mol} = 0.0278 \text{ mol}$$



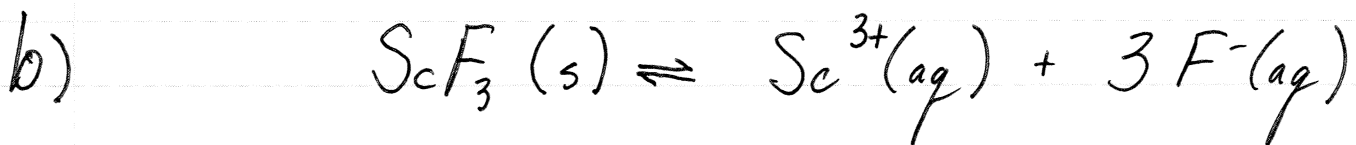
i:	0.028 mol	0.280 mol	0.220 mol
c:	-0.028 mol	-0.028 mol	+0.028 mol
e:	-	0.252 mol	0.248 mol

$$\text{pH} = \text{pK}_a + \log \left(\frac{[\text{NH}_3]}{[\text{NH}_4^+]}\right)$$

$$\text{pH} = -\log(5.5 \times 10^{-10}) + \log \left(\frac{0.248 \text{ mol} / 2.000 \text{ L}}{0.252 \text{ mol} / 2.000 \text{ L}} \right)$$

$$\text{pH} = \underline{\underline{9.25}}$$

a) -2



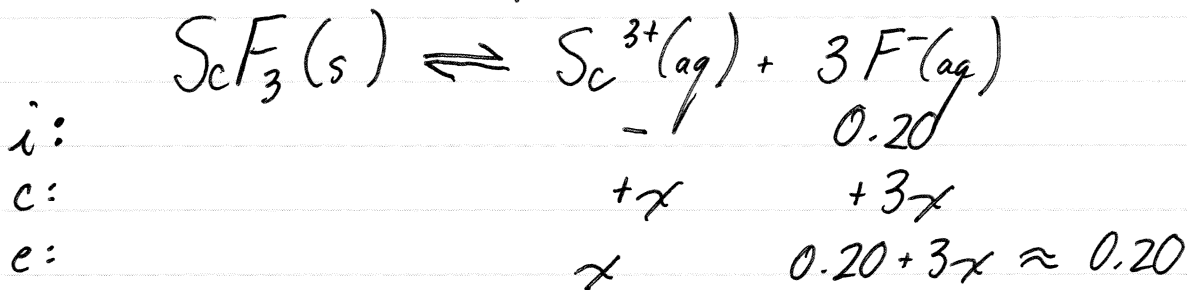
$$K_{ps} = [\text{Sc}^{3+}][\text{F}^-]^3 \Rightarrow 5.8 \times 10^{-24} = (x)(3x)^3$$

$$5.8 \times 10^{-24} = 27x^4 \Rightarrow x = \sqrt[4]{\frac{5.8 \times 10^{-24}}{27}}$$

$$x = 6.808 \times 10^{-7}$$

$$\begin{aligned} \text{solubilité} &= (6.808 \times 10^{-7} \text{ mol/L}) [44.96 + (3)(19.00)] \text{ g/mol} \\ &= \underline{\underline{6.9 \times 10^{-5} \text{ g/L}}} \end{aligned}$$

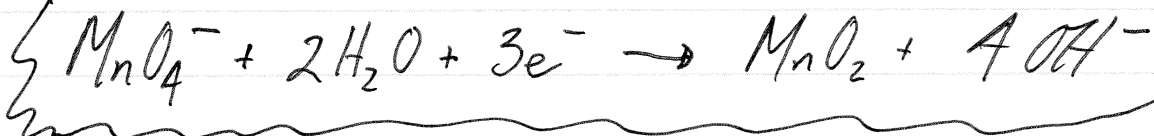
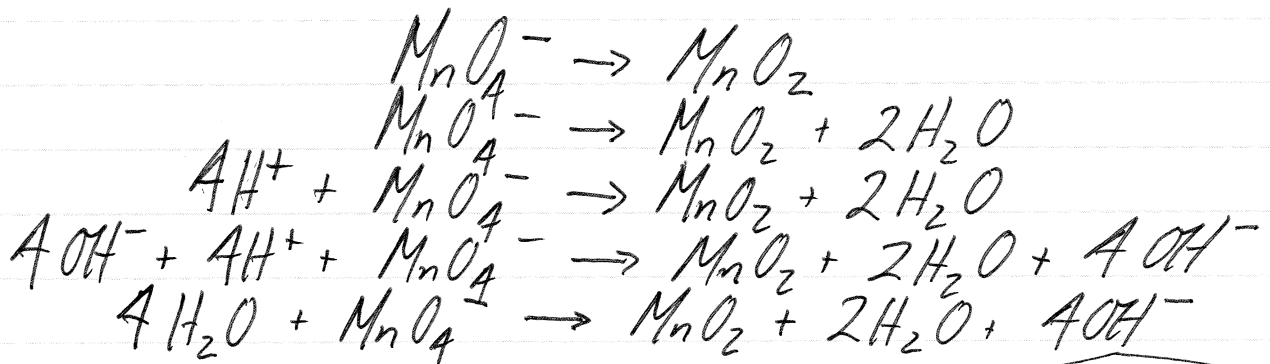
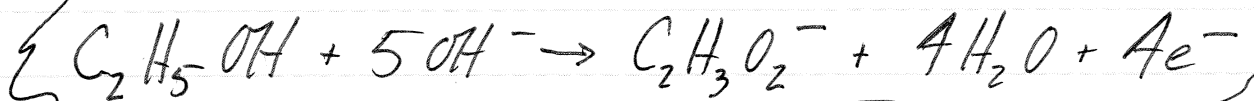
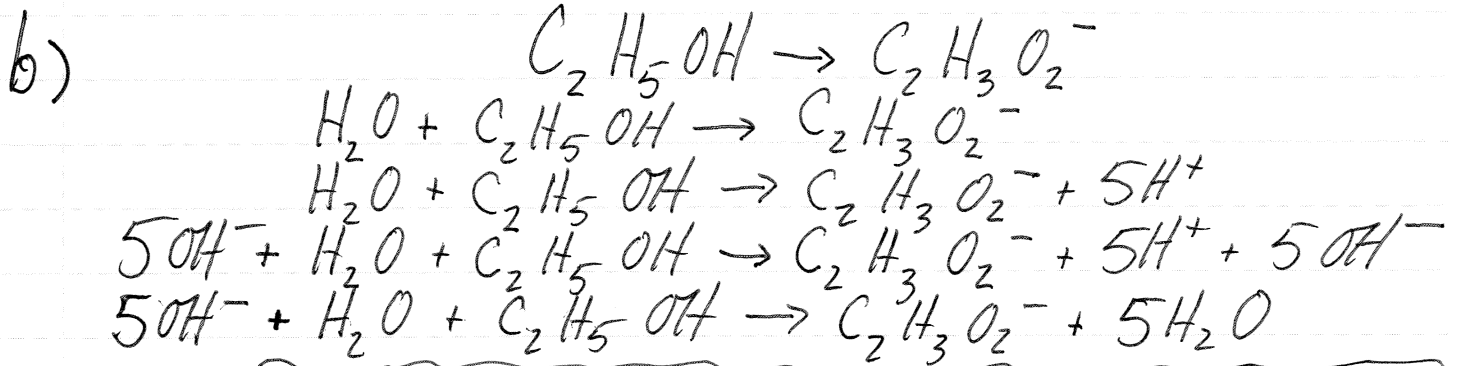
\Rightarrow dans une solution $\text{ZrF}_4(aq)$ 0.050 M, la concentration de $\text{F}^-(aq)$ est $4 \times 0.050 \text{ M} = 0.20 \text{ M}$



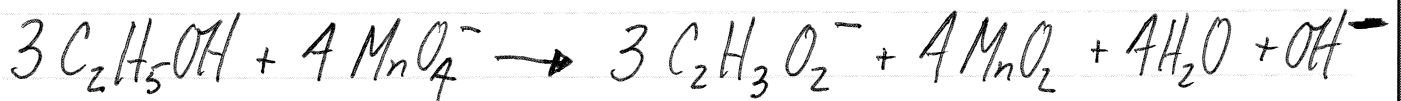
$$K_{ps} = [\text{Sc}^{3+}][\text{F}^-]^3 \Rightarrow 5.8 \times 10^{-24} = (x)(0.20)^3 \Rightarrow x = 7.25 \times 10^{-22}$$

$$\begin{aligned} \text{solubilité} &= (7.25 \times 10^{-22} \text{ mol/L}) [44.96 + (3)(19.00)] \text{ g/mol} \\ &= \underline{\underline{7.4 \times 10^{-20} \text{ g/L}}} \end{aligned}$$

a) > 7



⇒ on triple le premier et on quadruple le deuxième





b) \Rightarrow calculez le nombre de moles de CaF_2

$$\frac{0.2333 \text{ g}}{[40.08 + (2)(19.00)] \text{ g/mol}} = 0.0029880 \text{ mol}$$

\Rightarrow pour chaque mole de CaF_2 , on a deux moles de F^-

$$n_{\text{F}^-} = (2)(0.0029880 \text{ mol}) = 0.0059760 \text{ mol}$$

$$\text{masse } \text{F}^- = (0.0059760 \text{ mol})(19.00 \text{ g/mol})$$

$$\text{masse } \text{F}^- = 0.11354 \text{ g}$$

$$\% \text{ massique} = \frac{0.11354 \text{ g}}{0.7277 \text{ g}} \times 100\% = \underline{\underline{15.60\%}}$$

\Rightarrow pour avoir $[\text{F}^-] = 1.0 \times 10^{-5}$:

$$K_{ps} = [\text{Ca}^{2+}][\text{F}^-]^2$$

$$3.5 \times 10^{-11} = [\text{Ca}^{2+}](1.0 \times 10^{-5})^2$$

$$[\text{Ca}^{2+}] = \underline{\underline{0.35 \text{ M}}}$$