

LISTA 3

① a) 7,5 g / 25 °C SUPER SATURADA

b) 3,9 g / 35 °C INSATURADA

PERTURBANDO O SISTEMA : ATRITO OU GERME/CRISTAL

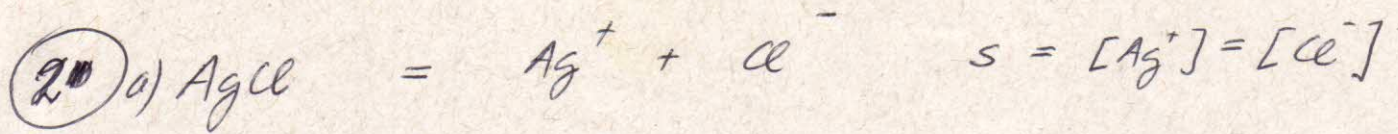
$$\Delta m = 7,5 - 3,9 = 3,6 \text{ g}$$

PRECIPITA $\approx 3,6 \text{ g}$ KNO_3 (SOLUÇÃO SATURADA C/
CORPO DE FUNDO)

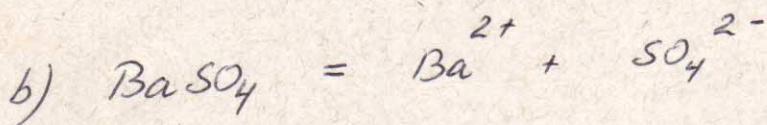
EFEITO TERMICO

EFEITO EXOTERMICO \Rightarrow LIBERA Q

LISTA 3 ~~TRADIZIONALE~~

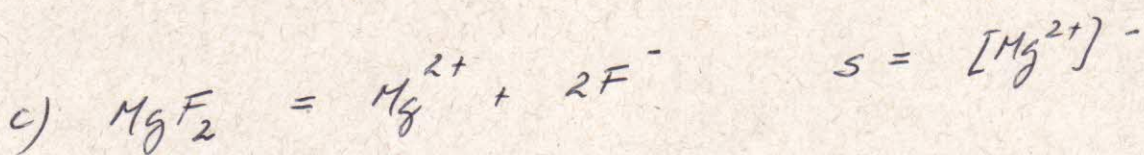


$$K_{ps} = [\text{Ag}^+][\text{Cl}^-] = s^2 \Rightarrow s = \sqrt{K_{ps}}$$



$$s = [\text{Ba}^{2+}] \quad K_{ps} = [\text{Ba}^{2+}][\text{SO}_4^{2-}] = s^2$$

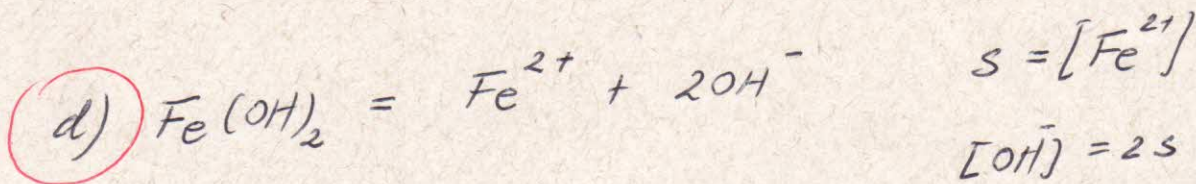
$$s = \sqrt{K_{ps}}$$



$$[\text{F}^-] = 2[\text{Mg}^{2+}] \Rightarrow [\text{F}^-] = 2s$$

$$K_{ps} = [\text{Mg}^{2+}][\text{F}^-]^2 = s \cdot (2s)^2 = 4s^3$$

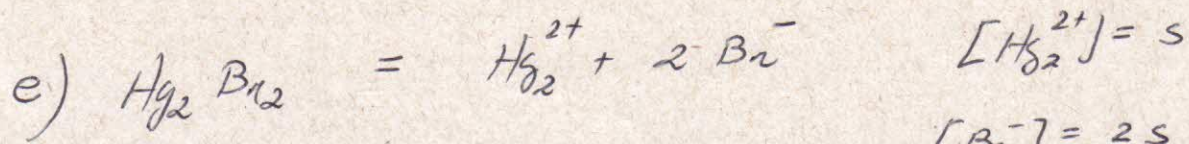
$$\text{ou} \quad s = \left(\frac{K_{ps}}{4}\right)^{1/3}$$



$$[\text{OH}^-] = 2s$$

$$K_{ps} = [\text{Fe}^{2+}][\text{OH}^-]^2$$

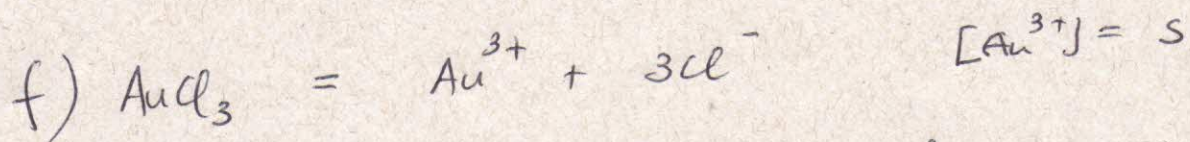
$$K_{ps} = 4s^3 \Rightarrow s = \left(\frac{K_{ps}}{4}\right)^{1/3}$$



$$[\text{Br}^-] = 2s$$

$$K_{ps} = [\text{Hg}_2^{2+}][\text{Br}^-]^2$$

$$K_{ps} = 4s^3 \Rightarrow s = \left(\frac{K_{ps}}{4}\right)^{1/3}$$



$$K_{ps} = [\text{Au}^{3+}] \cdot [\text{Cl}^-]^3 = s \cdot (3s)^3 = 27s^4$$

$$\text{ou } s = \left(\frac{K_{ps}}{27}\right)^{1/4}$$



$$s = [\text{Ca}^{2+}]$$

$$K_{ps} = [\text{Ca}^{2+}]^3 \cdot [\text{PO}_4^{3-}]^2$$

$$[\text{PO}_4^{3-}] = \left(\frac{2}{3}\right) [\text{Ca}^{2+}]$$

$$K_{ps} = s^3 \cdot \left(\frac{2}{3}s\right)^2$$

$$[\text{PO}_4^{3-}] = \left(\frac{2}{3}\right)s$$

$$K_{ps} = \left(\frac{4}{9}\right)s^5 \Rightarrow s = \left(\frac{9}{4} K_{ps}\right)^{1/5}$$

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CONTINUAÇÃO: SÉRIE SOLUBILIDADE

$$(a) [Ag^+] = S = \sqrt{K_{ps}} = \sqrt{1,8 \times 10^{-10}} = 1,34 \times 10^{-5} \text{ mol/L}$$

$$(b) [Ba^{2+}] = S = \sqrt{K_{ps}} = \sqrt{1,1 \times 10^{-10}} = 1,05 \times 10^{-5} \text{ mol/L}$$

$$(c) [Mg^{2+}] = S = \left(\frac{K_{ps}}{4} \right)^{1/3} = \left(\frac{6,6 \times 10^{-9}}{4} \right)^{1/3} = \underline{1,18 \times 10^{-3} \text{ mol/L}}$$

$$(d) [Fe^{2+}] = S = \left(\frac{K_{ps}}{4} \right)^{1/3} = \left(\frac{7,9 \times 10^{-16}}{4} \right)^{1/3} = 5,82 \times 10^{-6} \text{ mol/L}$$

$$(e) [Hg_2^{2+}] = S = \left(\frac{K_{ps}}{4} \right)^{1/3} = \left(\frac{5,6 \times 10^{-23}}{4} \right)^{1/3} = \underline{2,41 \times 10^{-8} \text{ mol/L}}$$

$$(f) [Au^{3+}] = S = \left(\frac{K_{ps}}{27} \right)^{1/4} = \left(\frac{3,2 \times 10^{-25}}{27} \right)^{1/4} = 3,3 \times 10^{-7} \text{ mol/L}$$

$$[Au^{3+}] = \left(1,1852 \times 10^{-26} \right)^{1/4} = \left(11,85 \times 10^{-27} \right)^{1/4}$$

$$(g) [Ca^{2+}] = S = \left(\frac{9}{4} K_{ps} \right)^{1/5} = \left(\frac{9 \cdot 2 \times 10^{-29}}{4} \right)^{1/5} = 2,14 \times 10^{-6} \text{ mol/L}$$

ASSIM

$$[Mg^{2+}] > [Ag^+] > [Ba^{2+}] > [Fe^{2+}] > [Ca^{2+}] > [Au^{3+}] > [Hg_2^{2+}]$$

3 ~~111~~) Oxalato de cálcio $\text{Ca C}_2\text{O}_4$



$$K_{ps} = [\text{Ca}^{2+}] \cdot [\text{C}_2\text{O}_4^{2-}]$$

1 L (25°C) contém 0,0061 g do
sal dissolvido.

$$\bar{M} = 40 + 24 + 64 = 128 \text{ g/mol}$$

$$[\text{Ca}^{2+}] = [\text{C}_2\text{O}_4^{2-}] = \frac{\text{m.º mols sal}}{1 \text{ L}} = \frac{0,0061 \text{ g}}{128 \text{ g/mol}}$$

$$K_{ps} = \left(4,765 \times 10^{-5} \right)^2$$

$$K_{ps} = 2,27 \times 10^{-9}$$

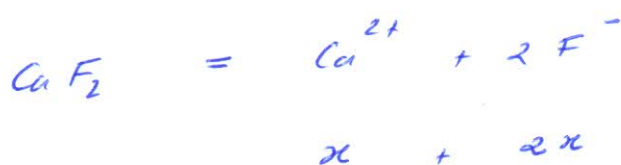
$K_{ps} \approx 2,3 \times 10^{-9}$



$$K_{ps} = [\text{Ca}^{2+}][\text{F}^-]^2 = 3,9 \times 10^{-11}$$

(a) $[\text{Ca}^{2+}] = 0,01 \text{ mol/L} + x$; $x = \text{solubilidade}$

onde $x = \text{quantidade proveniente do sol CaF}_2$
SOLUBILIDADE



$$[\text{F}^-] = 2x$$

Assim $K_{ps} = 3,9 \times 10^{-11} = (0,01 + x)(2x)^2$

Simplificando $0,01 + x \approx 0,01$ x / pequeno

Assim: $3,9 \times 10^{-11} = 0,01 \cdot 4x^2$

$$x = 3,1 \times 10^{-5} \text{ mol/L} \quad (\text{SOLUBILIDADE DO CaF}_2 \text{ na condic\u00e3o dada.})$$

(b) 0,01 mol NaF (solubiliza)

$$[\text{F}^-] = 0,01 + 2x \quad [\text{Ca}^{2+}] = x$$

ou

$$K_{ps} = 3,9 \times 10^{-11} = x \cdot (0,01 + 2x)^2$$

$$x \ll 0,01 \Rightarrow x \approx \frac{3,9 \times 10^{-11}}{(0,01)^2}$$

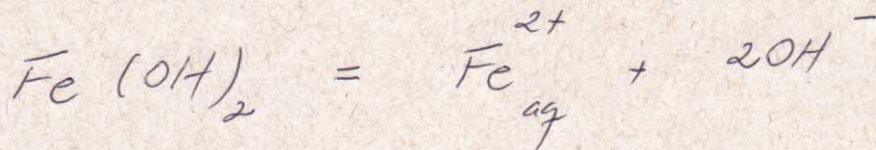
$$x = 3,9 \times 10^{-7} \text{ mol/L}$$

Assim: A solubilidade (x) do CaF_2 na
condição dada cai para $3,9 \times 10^{-7} \text{ mol/L}$

COMPARAÇÃO: A adição de NaF reduz
muito mais a solubilidade do CaF_2 devido
ao equilíbrio depender do quadrado da
conc. de F^- .

5) Qual será o pH de uma solução saturada em hidróxido ferroso ($T = 25^\circ\text{C}$)?

Eq.



Sabemos que $s = [\text{Fe}^{2+}] = 5,82 \times 10^{-6} \text{ mol/L}$

(ver 2a)

Então $[\text{OH}^-] = 2[\text{Fe}^{2+}] = 1,164 \times 10^{-5} \text{ mol/L}$

$$\text{pOH} = -\log[\text{OH}^-] = 4,93$$

Assim $\text{pH} = 14 - \text{pOH}$

$$\boxed{\text{pH} = 9,07}$$