

PROVA teórica

→ MASSA em excesso, solução saturada.

10A) 1g de $Ba_3(PO_4)_2$ em Água pura.



$$K_{ps} = 6,03 \times 10^{-39}$$

$$K_{ps} = [Ba^{2+}]^3 [PO_4^{3-}]^2$$

$$K_{ps} = (3s)^3 (2s)^2$$

$$K_{ps} = (27s^3)(4s^2)$$

$$K_{ps} = 108s^5$$

$$s = \sqrt[5]{\frac{K_{ps}}{108}} = s = \sqrt[5]{\frac{6,03 \times 10^{-39}}{108}} = s = \sqrt[5]{5,58 \times 10^{-41}}$$

$$s = 8,90 \times 10^{-9}$$

$$[Ba^{2+}] = 3s = 3 \times 8,90 \times 10^{-9} = 2,67 \times 10^{-8} \text{ mol L}^{-1}$$

$$[PO_4^{3-}] = 2s = 2 \times 8,90 \times 10^{-9} = 1,78 \times 10^{-8} \text{ mol L}^{-1}$$

1B) $BaCl_2 = Ba = 137 \text{ g mol}^{-1}$

$Cl = 35,5 \text{ g mol}^{-1} \times 2 = 71 \text{ g mol}^{-1}$

M.M = 208 g mol⁻¹

1 mol — 208g

x — 20,8g

$$x = 0,1 \text{ mol } BaCl_2$$

$$[Ba^{2+}] = 0,1 + 3s = 0,1 + 3 \times 1,23 \times 10^{-18} = 0,1 \text{ mol L}^{-1}$$

$$[PO_4^{3-}] = 2 \times s = 2 \times 1,23 \times 10^{-18} = 2,46 \times 10^{-18} \text{ mol L}^{-1}$$

$$K_{ps} = [Ba^{2+}]^3 [PO_4^{3-}]^2$$

valor muito pequeno.

$$K_{ps} = (0,1 + \cancel{3s})^3 (2s)^2$$

$$K_{ps} = 1,0 \times 10^{-3} \times 4s^2$$

$$6,03 \times 10^{-39} = 4,0 \times 10^{-3} s^2$$

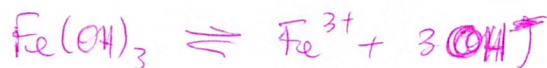
$$s = \sqrt{\frac{6,03 \times 10^{-39}}{4,0 \times 10^{-3}}} = \sqrt{1,51 \times 10^{-36}}$$

$$s = 1,23 \times 10^{-18}$$



$[Fe^{3+}] = 1,0 \times 10^{-7} \text{ mol/L}$

$\rightarrow pOH = -\log [OH^-]$
 $pOH = -\log (6,84 \times 10^{-11})$
 $pOH = 10,16$
 $pH = 14 - 10,16 = \boxed{3,84}$



$K_{ps} = [Fe^{3+}] [OH^-]^3$

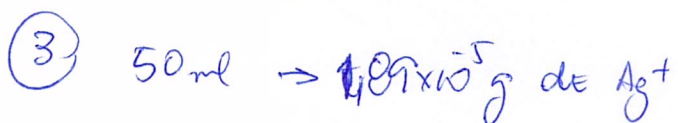
$3,2 \times 10^{-38} = 1,0 \times 10^{-7} [OH^-]^3$

$[OH^-] = \sqrt[3]{\frac{3,2 \times 10^{-38}}{1,0 \times 10^{-7}}}$

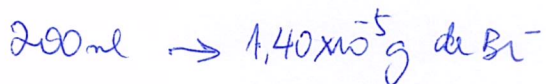
$[OH^-] = \sqrt[3]{3,2 \times 10^{-31}}$

$[OH^-] = 6,84 \times 10^{-11} \text{ mol/L}$

Em pH 2,0 todo o precipitado seria solubilizado. Valor de pH Abaixo do pH de Equilíbrio.



$1 \text{ mol} \text{ --- } 108 \text{ g}$
 $x \text{ --- } 1,89 \times 10^{-5} \text{ g} \quad x = 1,75 \times 10^{-7} \text{ mol } Ag^+$

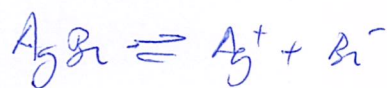


$1 \text{ mol} \text{ --- } 80 \text{ g}$
 $x \text{ --- } 1,40 \times 10^{-5} \text{ g} \quad x = 1,75 \times 10^{-7} \text{ mol } Bi^-$

Cálculo da concentração.

$[Ag^+] = \frac{1,75 \times 10^{-7} \text{ mol } Ag^+}{0,25 \text{ L}} = 7,0 \times 10^{-7} \text{ mol/L}$

$[Bi^-] = \frac{1,75 \times 10^{-7} \text{ mol } Bi^-}{0,25 \text{ L}} = 7,0 \times 10^{-7} \text{ mol/L}$



$K_{ps} = [Ag^+]^2 [Bi^-] = 5,3 \times 10^{-13}$

$Q = [Ag^+]^2 [Bi^-]$

$Q = 7,0 \times 10^{-7} \times 7,0 \times 10^{-7}$

$\boxed{Q = 4,9 \times 10^{-13}}$

$\boxed{Q < K_{ps}} \Rightarrow \boxed{\text{NÃO precipita.}}$

④ $pH = 5,0$

$Fe^{2+} = 0,1 \text{ mol l}^{-1}$

$EDTA = 0,2 \text{ mol l}^{-1}$

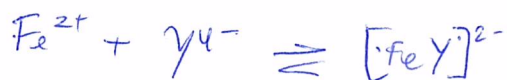
$\log K_{est} = 14,33 \rightarrow 10^{14,33} = K_{est} = 2,14 \times 10^{14}$

$\alpha_{Y^{4-}}^{pH=5,0} = 2,47 \times 10^{-7}$

③ $\alpha_{Y^{4-}} = 0,2 \times 2,47 \times 10^{-7}$

$\alpha_{Y^{4-}} = 4,94 \times 10^{-9}$

→ EDTA.



$K_{est} = \frac{[FeY]^{2-}}{[Fe^{2+}][Y^{4-}]}$

$2,14 \times 10^{14} = \frac{x}{(0,1-x) \cdot 4,94 \times 10^{-8}}$

$2,14 \times 10^{14} = \frac{x}{4,94 \times 10^{-9} - 4,94 \times 10^{-8} x}$

$1,06 \times 10^6 - 1,06 \times 10^7 x = x$

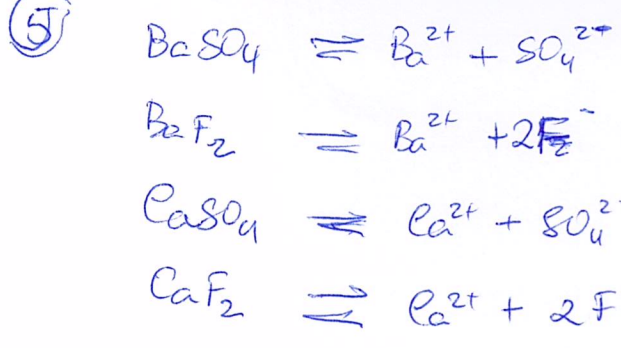
$1,06 \times 10^6 = x + 1,06 \times 10^7 x$

$x = \frac{1,06 \times 10^6}{1,06 \times 10^7} = 0,1 \text{ mol l}^{-1}$

0,1 — 100%

0,1 — x

$x = 100\%$ do Fe^{2+} complexado

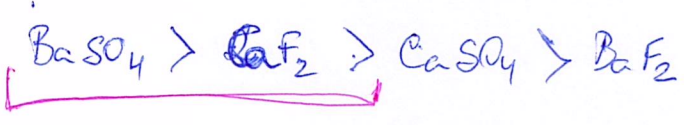


Cations : Ba^{2+} e Ca^{2+}
 Ânions : SO_4^{2-} e F^-

$K_{ps} \quad BaSO_4 = 1,1 \times 10^{-10} \Rightarrow \Delta = \sqrt{K_{ps}} = \boxed{1,05 \times 10^{-5} \text{ mol l}^{-1}}$
 $BaF_2 = 1,1 \times 10^{-6} \Rightarrow \Delta = \sqrt[3]{\frac{K_{ps}}{4}} = \boxed{6,50 \times 10^{-3} \text{ mol l}^{-1}}$
 $CaSO_4 = 9,1 \times 10^{-6} \Rightarrow \Delta = \sqrt{K_{ps}} = \boxed{3,02 \times 10^{-3} \text{ mol l}^{-1}}$
 $CaF_2 = 4,0 \times 10^{-11} \Rightarrow \Delta = \sqrt[3]{\frac{K_{ps}}{4}} = \boxed{2,15 \times 10^{-4} \text{ mol l}^{-1}}$

Ordem de solubilidade

mas insolúvel



dois mais
 insolúveis.