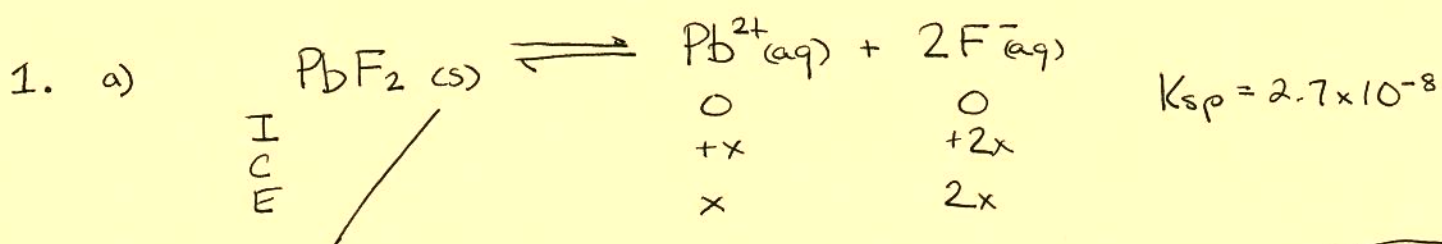


Ksp question

(1a)



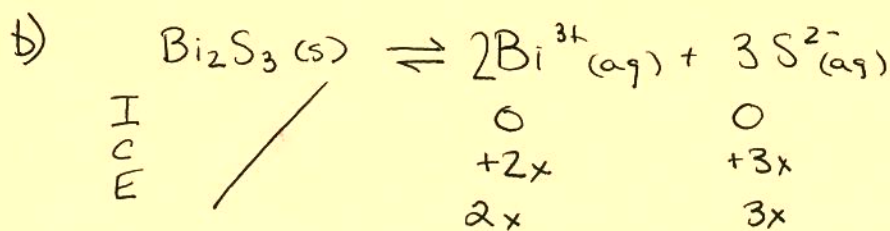
$$K_{\text{sp}} = [\text{Pb}^{2+}][\text{F}^{-}]^2$$

$$2.7 \times 10^{-8} = (x)(2x)^2$$

$$4x^3 = 2.7 \times 10^{-8}$$

$$x = 1.9 \times 10^{-3}$$

solubility  $\text{PbF}_2 = [\text{Pb}^{2+}] = \frac{1}{2}[\text{F}^{-}]$   
 $= 1.9 \times 10^{-3} \frac{\text{mol}}{\text{L}}$



$$K_{\text{sp}} = [\text{Bi}^{3+}]^2[\text{S}^{2-}]^3$$

$$1.0 \times 10^{-96} = (2x)^2(3x)^3$$

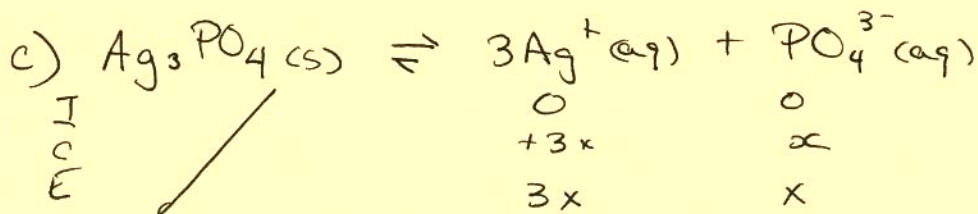
$$1.0 \times 10^{-96} = (4x^2)(27x^3)$$

$$108x^5 = 1.0 \times 10^{-96}$$

$$x^5 = 9.26 \times 10^{-97}$$

$$x = 2.45 \times 10^{-20}$$

solubility  $\text{Bi}_2\text{S}_3 = \frac{1}{2}[\text{Bi}^{3+}] = \frac{1}{3}[\text{S}^{2-}]$   
 $= 2.5 \times 10^{-20} \frac{\text{mol}}{\text{L}}$



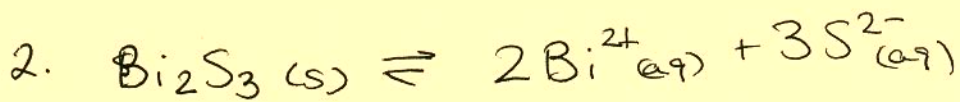
$$K_{\text{sp}} = [\text{Ag}^{+}]^3[\text{PO}_4^{3-}]$$

$$1.0 \times 10^{-21} = (3x)^2(x)$$

$$4x^3 = 1.0 \times 10^{-21}$$

$$x = 6.3 \times 10^{-8}$$

solubility  $\text{Ag}_3\text{PO}_4 = \frac{1}{3}[\text{Ag}^{+}] = [\text{PO}_4^{3-}]$   
 $= 6.3 \times 10^{-8} \frac{\text{mol}}{\text{L}}$

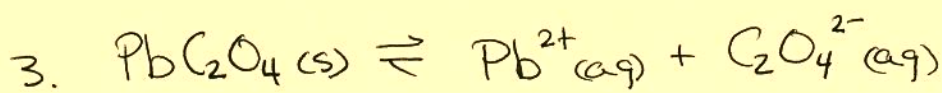


$$\text{solubility } \text{Bi}_2\text{S}_3 = \frac{1}{3} [\text{S}^{2-}]$$

$$[\text{S}^{2-}] = 2 (\text{solubility } \text{Bi}_2\text{S}_3)$$

$$= 2 (2.5 \times 10^{-20} \frac{\text{mol}}{\text{L}})$$

$$\boxed{[\text{S}^{2-}]_{\text{eqm}} = 5.0 \times 10^{-20} \frac{\text{mol}}{\text{L}}}$$



$$\text{solubility } \text{PbC}_2\text{O}_4 = [\text{Pb}^{2+}] = [\text{C}_2\text{O}_4^{2-}]$$

$$M_{\text{PbC}_2\text{O}_4} = 263.22 \frac{\text{g}}{\text{mol}}$$

$$= 1.6 \times 10^{-3} \frac{\text{g } \text{PbC}_2\text{O}_4}{\text{L}} \times \frac{1 \text{ mol } \text{PbC}_2\text{O}_4}{263.22 \text{ g } \text{PbC}_2\text{O}_4}$$

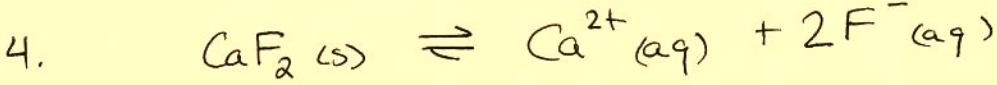
$$= 6.1 \times 10^{-6}$$

$$[\text{Pb}^{2+}]_{\text{eqm}} = [\text{C}_2\text{O}_4^{2-}]_{\text{eqm}} = 6.1 \times 10^{-6} \frac{\text{mol}}{\text{L}}$$

$$K_{\text{sp}} = [\text{Pb}^{2+}] [\text{C}_2\text{O}_4^{2-}]$$

$$= (6.1 \times 10^{-6})(6.1 \times 10^{-6})$$

$$\boxed{K_{\text{sp}} = 3.7 \times 10^{-11}}$$



solubility  $\text{CaF}_2 = 1.2 \times 10^{-2} \frac{\text{g}}{\text{L}} \times \frac{1 \text{ mol CaF}_2}{78.08 \text{ g CaF}_2} = 1.54 \times 10^{-4} \frac{\text{mol}}{\text{L}}$

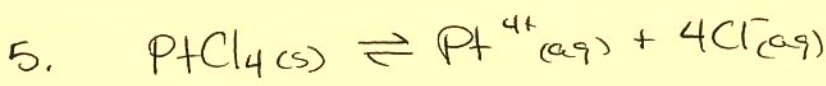
$= [\text{Ca}^{2+}] = \frac{1}{2} [\text{F}^{-}]$

$[\text{Ca}^{2+}]_{\text{eq'm}} = 1.5 \times 10^{-4} \frac{\text{mol}}{\text{L}} \quad \frac{1}{2} [\text{F}^{-}] = 1.54 \times 10^{-4} \frac{\text{mol}}{\text{L}}$

$[\text{F}^{-}] = 3.1 \times 10^{-4} \frac{\text{mol}}{\text{L}}$

$K_{sp} = [\text{Ca}^{2+}][\text{F}^{-}]^2$   
 $= (1.5 \times 10^{-4})(3.1 \times 10^{-4})^2$

$K_{sp} = 1.4 \times 10^{-11}$



solubility  $\text{PtCl}_4 = 587 \frac{\text{g}}{\text{L}} \times \frac{1 \text{ mol PtCl}_4}{336.88 \text{ g}}$

$= 1.74 \frac{\text{mol}}{\text{L}}$

$M_{\text{PtCl}_4} = 336.88 \frac{\text{g}}{\text{mol}}$

solubility  $\text{PtCl}_4 = [\text{Pt}^{4+}] = \frac{1}{4} [\text{Cl}^{-}]$

$[\text{Pt}^{4+}]_{\text{eq'm}} = 1.74 \frac{\text{mol}}{\text{L}}$

$\frac{1}{4} [\text{Cl}^{-}] = 1.74 \frac{\text{mol}}{\text{L}}$

$[\text{Cl}^{-}]_{\text{eq'm}} = 6.97 \frac{\text{mol}}{\text{L}}$

$K_{sp} = [\text{Pt}^{4+}][\text{Cl}^{-}]^4$   
 $= (1.74)(6.97)^4$

$K_{sp} = 4.1 \times 10^3$