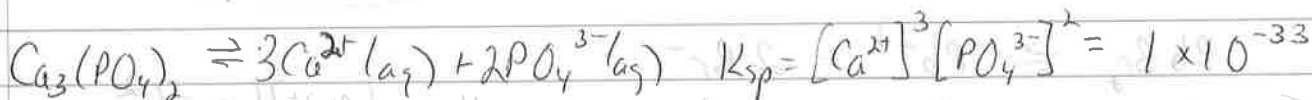
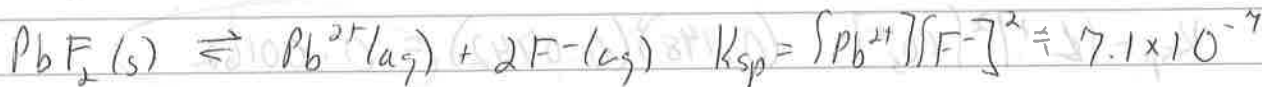
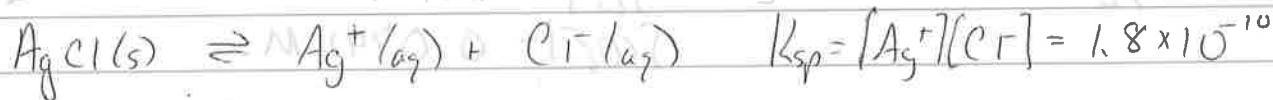


Solubility Product Packet

PRACTICE #1



PRACTICE #2

AgCl: $K_{sp} = [\text{Ag}^+][\text{Cl}^-] = (x)(x) = 1.8 \times 10^{-10}$ $x = [\text{Ag}^+] \text{ and } [\text{Cl}^-] = 1.3 \times 10^{-5} \text{ M}$

solubility AgCl = $\frac{1.3 \times 10^{-5} \text{ mol}}{\text{L}} = 1.9 \times 10^{-3} \text{ g/L}$

PbF₂: $K_{sp} = [\text{Pb}^{2+}][\text{F}^-]^2 = (x)(2x)^2 = 4x^3 = 7.1 \times 10^{-7}$ $x = 5.6 \times 10^{-3}$

$[\text{Pb}^{2+}] = 5.6 \times 10^{-3} \text{ M}$ $[\text{F}^-] = 1.12 \times 10^{-2} \text{ M}$

solubility PbF₂ = $\frac{5.6 \times 10^{-3} \text{ mol}}{\text{L}} \Rightarrow 1.37 \text{ g/L}$

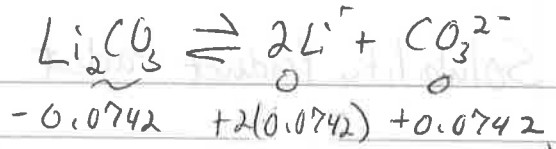
Ca₃(PO₄)₂: $K_{sp} = [\text{Ca}^{2+}]^3[\text{PO}_4^{3-}]^2 = (3x)^3(2x)^2 = 108x^5 = 1 \times 10^{-33}$ $x = 9.8 \times 10^{-8} \text{ mol/L}$

$[\text{Ca}^{2+}] = 2.9 \times 10^{-7} \text{ M}$ $[\text{PO}_4^{3-}] = 1.96 \times 10^{-7} \text{ M}$

solubility Ca₃(PO₄)₂ = $3 \times 10^{-5} \text{ g/L}$

(PM = 310.3)

PRACTICE #3



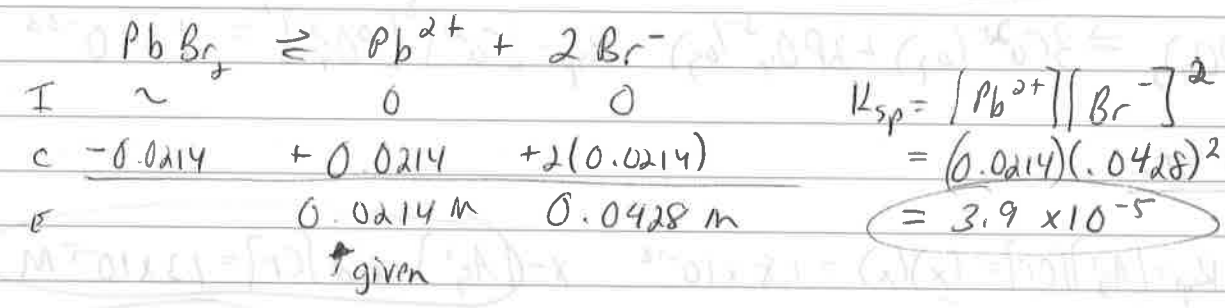
(a)

5.48 g/L \Rightarrow 0.0742 mol/L

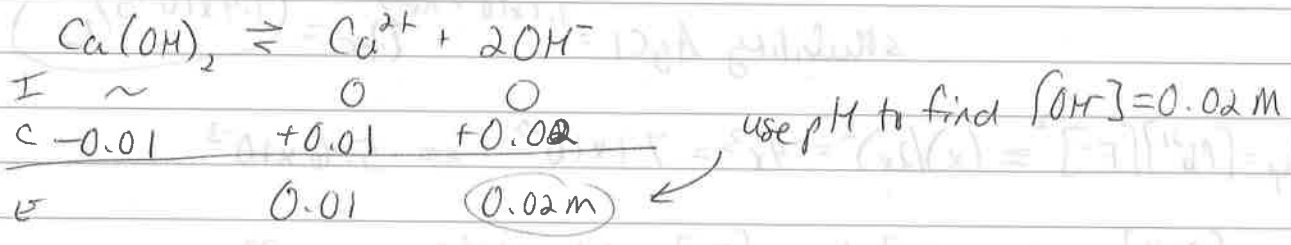
I	~	0	0
C	-0.0742	+0.1484	+0.0742
E	~	0.148 M	0.0742 M

$$K_{sp} = [\text{Li}^+]^2 [\text{CO}_3^{2-}] = (0.148)^2 (0.0742) = 0.00162$$

(b)

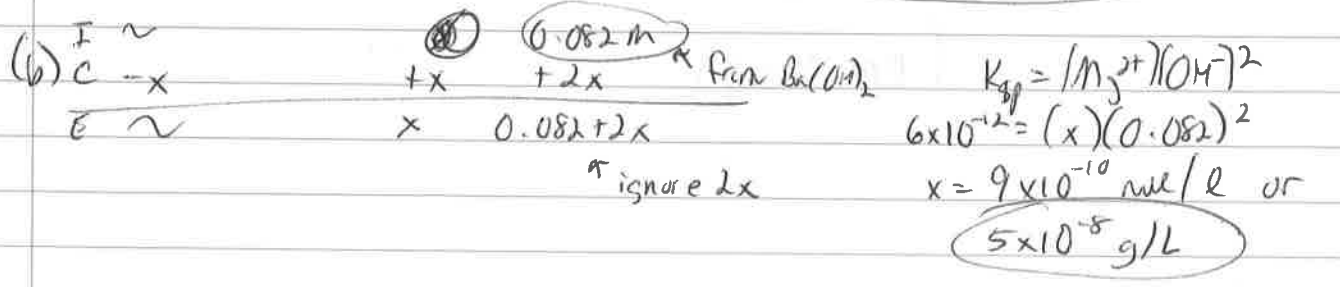
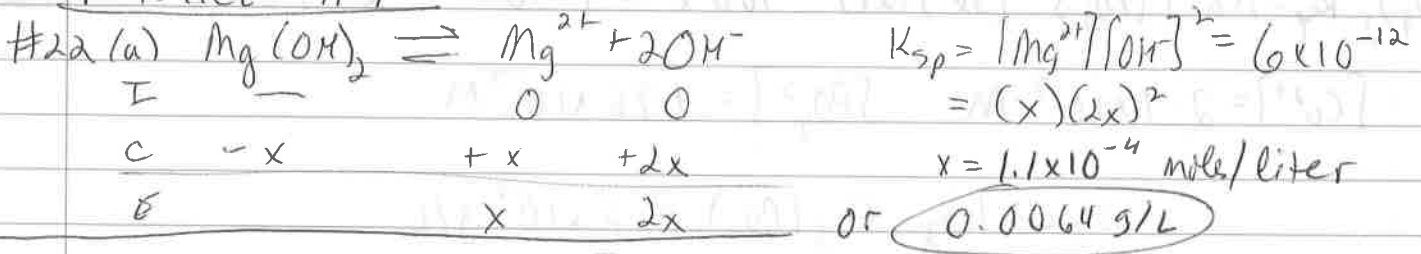


(c)

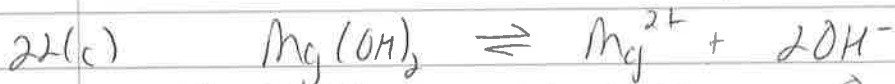


$$K_{sp} = [\text{Ca}^{2+}] [\text{OH}^-]^2 = (0.01)(0.02)^2 = 4 \times 10^{-6}$$

PRACTICE #4



PRACTICE #4 cont'd ↙ given from $MgCl_2$



$\pm \sim$ 0.0050 0

$\pm \sim$ $+x$ $+2x$

$\pm \sim$ $0.0050+x$ $2x$

$K_{sp} = [Mg^{2+}][OH^-]^2 = 6 \times 10^{-12}$
 $(0.0050)(2x)^2 = 6 \times 10^{-12}$

$x = 1.73 \times 10^{-5} \text{ mol/liter}$

$1 \times 10^{-3} \text{ g/L}$

PRACTICE #5

Summary (c) What is the potential ppt? $Pb(OH)_2$

Use K_{sp} for $Pb(OH)_2$

+ dissolving equation for



$K_{sp} = [Pb^{2+}][OH^-]^2 = 4.2 \times 10^{-15}$

$M_1 V_1 = M_2 V_2$

combined volume

$(0.01500L)(0.0100M) = M_2(0.490L)$ $M_2 = [OH^-] \text{ in mixture} = 3.06 \times 10^{-4} M$

$(0.475L)(0.0075M) = M_2(0.490)$ $M_2 = [Pb^{2+}] \text{ in mixture} = 0.0073 M$

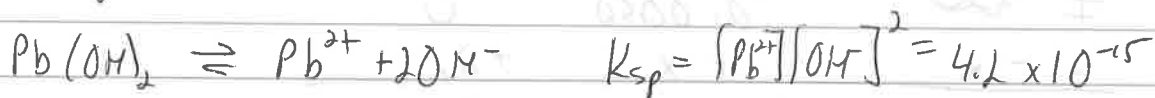
$Q = [Pb^{2+}][OH^-]^2 = (0.0073)(3.06 \times 10^{-4})^2 = 6.8 \times 10^{-10}$

$Q > K_{sp}$, so ~~forward~~ REVERSE reaction is favored.

Yes, PPT forms!

PRACTICE #5 cont'd

Summary (g)



In solution, $[\text{Pb}^{2+}] = \frac{0.0200 \text{ mol}}{0.425 \text{ L}} = 0.047 \text{ M}$

$$[\text{Fe}^{2+}] = \frac{0.0200 \text{ mol}}{0.425 \text{ L}} = 0.047 \text{ M}$$

Ignore given amount of $\text{OH}^- \rightarrow$ It will NOT be added all at once, but instead will be slowly added.

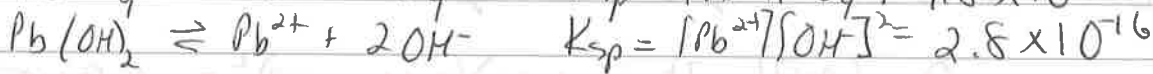
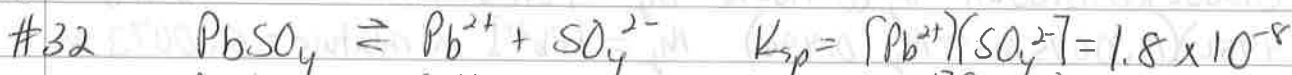
Plug in & solve for OH^- in each K_{sp} expression:

$$\text{Pb(OH)}_2 \quad 4.2 \times 10^{-15} = (0.047)[\text{OH}^-]^2 \quad [\text{OH}^-] = 3 \times 10^{-7} \text{ M}$$

$$\text{Fe(OH)}_2 \quad 5 \times 10^{-17} = (0.047)[\text{OH}^-]^2 \quad [\text{OH}^-] = 3.3 \times 10^{-8} \text{ M} \leftarrow \text{this will be exceeded FIRST}$$

So Fe(OH)_2 will precipitate first

p 440



Solve for Pb^{2+} in each:

$$\text{PbSO}_4: \quad 1.8 \times 10^{-8} = [\text{Pb}^{2+}][0.020 \text{ M}] \quad [\text{Pb}^{2+}] = 9 \times 10^{-7} \text{ M}$$

$$\text{Pb(OH)}_2: \quad 2.8 \times 10^{-16} = [\text{Pb}^{2+}][0.020 \text{ M}]^2 \quad [\text{Pb}^{2+}] = 7 \times 10^{-13} \text{ M}$$

↑ exceeded first

Pb(OH)_2 forms first

(b) OMIT

KADOMIT