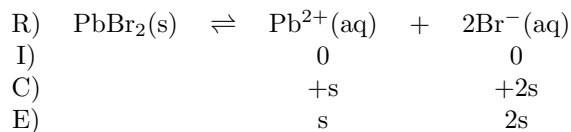# Non Sibi High School

Andover's Chem 300: Accelerated/Honors Chemistry
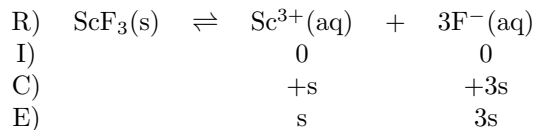
Chapter 18, Review Quiz 1 Answers

1

Calculate the molar solubility of lead(II) bromide ($K_{sp} = 4.0 \times 10^{-5}$). Include the solubility equilibrium reaction and K_{sp} expression in your answer.

$$
\begin{array}{llccc}
\text{R)} & \text{PbBr}_2(\text{s}) & \rightleftharpoons & \text{Pb}^{2+}(\text{aq}) & + & 2\text{Br}^-(\text{aq}) \\
\text{I)} & & & 0 & & 0 \\
\text{C)} & & & +\text{s} & & +2\text{s} \\
\text{E)} & & & \text{s} & & 2\text{s}
\end{array}
$$

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

$$4.0 \times 10^{-5} = (\text{s})(2\text{s})^2$$

$$\text{s} = 0.022\,\text{M}$$

2

The molar solubility of scandium(III) fluoride is 1.9×10^{-5} M. Calculate the value of K_{sp} for scandium(III) fluoride. Include the solubility equilibrium reaction and K_{sp} expression in your answer.
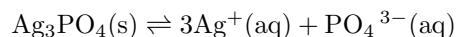
$$
\begin{array}{llccc}
\text{R)} & \text{ScF}_3(\text{s}) & \rightleftharpoons & \text{Sc}^{3+}(\text{aq}) & + & 3\text{F}^-(\text{aq}) \\
\text{I)} & & & 0 & & 0 \\
\text{C)} & & & +\text{s} & & +3\text{s} \\
\text{E)} & & & \text{s} & & 3\text{s}
\end{array}
$$

$$K_{sp} = [\text{Sc}^{3+}][\text{F}^-]^3 = (\text{s})(3\text{s})^3 = 27\text{s}^4 = 27(1.9 \times 10^{-5})^4 = 3.5 \times 10^{-18}$$

3

Predict if precipitation will occur when 14 mL of 6.5×10^{-5} M $AgNO_3$ is mixed with 56 mL of 3.5×10^{-4} M K_3PO_4. ($K_{sp} = 8.9 \times 10^{-17}$ for Ag_3PO_4)

K^+ and $NO_3{}^-$ = spectator ions

$Ag_3PO_4(s) \rightleftharpoons 3Ag^+(aq) + PO_4{}^{3-}(aq)$

total volume after mixing = 14 mL + 56 mL = 70 mL

$[Ag^+]_i = 6.5 \times 10^{-5}\,M\left(\dfrac{14\,mL}{70\,mL}\right) = 1.3 \times 10^{-5}\,M$

$[PO_4{}^{3-}]_i = 3.5 \times 10^{-4}\,M\left(\dfrac{56\,mL}{70\,mL}\right) = 2.8 \times 10^{-4}\,M$

$Q_{sp} = (1.3 \times 10^{-5})^3(2.8 \times 10^{-4}) = 6.2 \times 10^{-19} < K_{sp}$, no precipitate

4

A metal hydroxide with the formula $M(OH)_2$ was mixed with water and stirred until a saturated solution was created. The pH of the solution was found to be 9.88. Calculate the value of K_{sp} for the metal hydroxide.

R)	$M(OH)_2(s)$	$\rightleftharpoons$	$M^{2+}(aq)$	+	$2OH^-(aq)$
I)			0		0
C)			+s		+2s
E)			s		2s
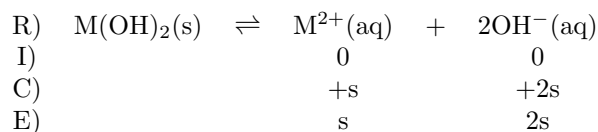
$pOH = 14.00 - 9.88 = 4.12$

$[OH^-] = 10^{-4.12} = 7.6 \times 10^{-5}\,M = 2s$

$s = 3.8 \times 10^{-5}\,M$

$K_{sp} = [M^{2+}][OH^-]^2 = (s)(2s)^2 = 4s^3 = 4(3.8 \times 10^{-5})^3 = 2.2 \times 10^{-13}$