PRACTICE: **SOLUBILITY CALCULATIONS**

ANSWERS

1.

	$Ba(NO_3)_2(s)$	$\rightleftharpoons$	$Ba^{2+}(aq)$	+	$2\ NO_3^-(aq)$
I	—		0		0
C	—		+x		+2x
E	—		x		2x

$$
\begin{aligned}
K_{sp} &= [Ba^{2+}(aq)]\,[NO_3^-(aq)]^2 \\
&= (x)(2x)^2 \\
&= 4x^3 \\
&= 4(0.105)^3 \qquad \text{\{molar solubility = 0.105 mol/L, therefore, x =0.105\}} \\
&= 4.6305\times10^{-3}
\end{aligned}
$$

Therefore, the solubility product constant for barium nitrate at 25°C is 4.63×10^{-3}.

2.

	$Zn(OH)_2(s)$	$\rightleftharpoons$	$Zn^{2+}(aq)$	+	$2\ OH^-(aq)$
I	—		0		0
C	—		+x		+2x
E	—		x		2x

$$
\begin{aligned}
K_{sp} &= [Zn^{2+}(aq)]\,[OH^-(aq)]^2 \\
7.7\times10^{-17} &= (x)(2x)^2 \qquad \text{\{}K_{sp} = 7.7\times10^{-17}\text{ from data table on p19 in course manual\}} \\
7.7\times10^{-17} &= 4x^3 \\
1.925\times10^{-17} &= x^3 \qquad \text{\{divide by 4\}} \\
2.680...\times10^{-6} &= x \qquad \text{\{take cube root\}}
\end{aligned}
$$

Therefore, the molar solubility of zinc hydroxide in water at 25°C is 2.7×10^{-6} mol/L.

3. The solubility product constant for silver chloride (1.8×10^{-10}) is greater than the solubility product constant for silver bromide (5.4×10^{-13}). Therefore, silver chloride has the greater solubility.