The common ion effect, predicting precipitation:

Read pg. 580 – 582
(common ion effect section only).
Do PE 20 - 21

Example 14.17 (pg. 581)

Molar solubility of PbI_2? Ksp = 7.9×10^{-9}

Concentration of NaI is 0.10, thus $[I^-] = 0.10$

$NaI(s) \leftrightarrow Na^+(aq) + I^-(aq)$

	$PbI_2(s)$	$Pb^{2+}(aq)$	$I^-(aq)$
R		1	2
I		0	0.10
C		x	2x
E		x	0.10 + 2x

$Ksp = [Pb^{2+}(aq)]\,[I^-(aq)]^2$

$Ksp = [x]\,[0.10 + 2x]^2 = 7.9 \times 10^{-9}$

x is small, thus we can ignore 2x in 0.10 + 2x

$Ksp = [x]\,[0.10]^2 = 7.9 \times 10^{-9}$, $x = 7.9 \times 10^{-7}$ *M*

Predicting when precipitation occurs

Read pg. 582. Do PE 22, 23

Similar to Kc vs. mass action expression to predict if equilibrium exists (and which way it will shift)

E.g. in example 14.18

$PbCl_2(s) \leftrightarrow Pb^{2+}(aq) + 2Cl^-(aq)$

(NaCl and $Pb(NO_3)$ are soluble according to the solubility rules; they will not precipitate)

$Ksp = 1.7 \times 10^{-5}$, $[Pb^{2+}][Cl^-]^2 = 3.4 \times 10^{-5}$

Ion product is large … to reduce, equilibrium must shift left … precipitate forms

Predicting when precipitation occurs

- So far we have been dealing with one of two situations:
- 1) dissolving a solid in a liquid (with or without initial concentrations of ions) and performing Ksp calculations
- 2) given the concentrations of ions predicting if a solid (I.e. precipitate will form)
- A third situation exists that is slightly different
- Mixing two liquids
- In this case, we need to account for both the ions and the water that is added …

Predicting when precipitation occurs

Q- E.g. will the addition of a NaCl solution to a saturated $PbCl_2$ solution result in a precipitate forming?

A- It depends on the concentration of the NaCl solution

If the NaCl solution is very dilute, the extra water could cause more $PbCl_2(s)$ to dissolve, than the extra Cl^- causes $PbCl_2(s)$ to form

Read the example on pg. 583, do PE 24, 25