

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 ? $K_{sp} = 7.9 \times 10^{-9}$
Concentration of NaI is 0.10, thus $[\text{I}^-] = 0.10$



	$\text{PbI}_2\text{(s)}$	$\text{Pb}^{2+}\text{(aq)}$	$\text{I}^-\text{(aq)}$
R		1	2
I		0	0.10
C		x	2x
E		x	0.10 + 2x

$$K_{sp} = [\text{Pb}^{2+}\text{(aq)}][\text{I}^-\text{(aq)}]^2$$

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

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

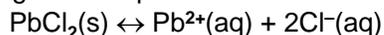
$$K_{sp} = [x][0.10]^2 = 7.9 \times 10^{-9}, x = 7.9 \times 10^{-7} \text{ M}$$

Predicting when precipitation occurs

Read pg. 582. Do PE 22, 23

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

E.g. in example 14.18



(NaCl and $\text{Pb}(\text{NO}_3)_2$ are soluble according to the solubility rules; they will not precipitate)

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

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 K_{sp} 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 $\text{PbCl}_2\text{(s)}$ to dissolve, than the extra Cl^- causes $\text{PbCl}_2\text{(s)}$ to form

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