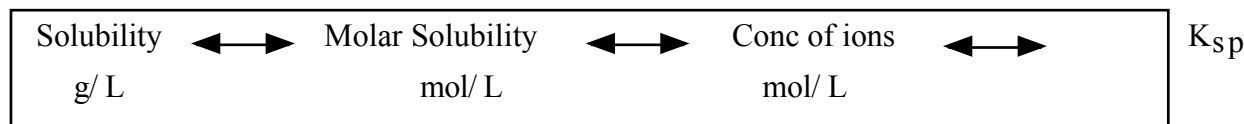


Solubility Review

Ap Chemistry

1. SIMPLE CONVERSIONS.



2. Problems involving a saturated solution - YOUR IN EQ!! ICE TABLE!!

a. Calc. molar or gram solubility from K_{sp}

EX: $Ca(OH)_2 \rightleftharpoons Ca^{2+} + 2 OH^-$

<i>I</i>	?	0	0
<i>C</i>	-x	+x	+2x
<i>E</i>	? - x	x	2x

$$K_{sp} = (x)(2x)^2 \dots x = \text{mol/L of } Ca(OH)_2 \text{ that actually dissolved} = [Ca(OH)_2] \dots \text{convert to g/L!}$$

b. Common ion effect.

EX: Add solid $Ca(OH)_2$ to a 0.1 M OH^-

	$Ca(OH)_2$	$Ca^{2+} + 2 OH^-$
<i>I</i>	?	0 0.1
<i>C</i>	-x	+x +2x
<i>E</i>	? - x	x 0.1 + 2x

$$K_{sp} = (x)(0.1 + 2x)^2 \dots x = \text{mol/L of } Ca(OH)_2 \text{ that actually dissolved} = [Ca(OH)_2] \dots \text{convert to g/L!}$$

c. pH and solubility

EX: pH = 10.0 for a $Ca(OH)_2$ soln. Molar Sol?

NO ICE!!

$$K_{sp} = [Ca^{2+}][OH^-]^2$$

$$K_{sp} = [Ca^{2+}][10^{-4}]^2$$

$$[Ca^{2+}] = \underline{\hspace{2cm}} = [Ca(OH)_2]$$

3. REACTIONS

a. Will something ppt? Q PROBLEM!!

i. The Simple Q problem:

EX: Will MgF_2 ppt when you mix 100 mL each of 0.5 M $Mg(NO_3)_2$ and 0.5 M NaF ?

step 1: Calculate $[Mg^{2+}]$ and $[F^-]$ taking into account dilution and mixing of solutions.

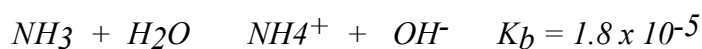
step 2: Plug into Q expression. Compare Q to K_{sp}

ii. The More Complex (yet fun!) Q problem - One's involving EQUILIBRIA!!

EX: Will $Cu(OH)_2$ ppt when 100 mL of 0.5M $Cu(NO_3)_2$ and 100 mL of 0.5 M NH_3 are mixed?

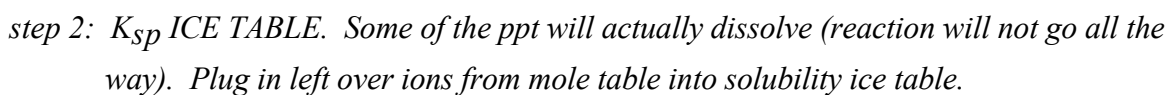
step 1: Determine $[Cu^{2+}]$ taking into account dilution and mixing of solutions.

step 2: Determine $[OH^-]$ from WB ICE table?



b. Calculating a specific concentration of ions remaining after a D.R. reaction.

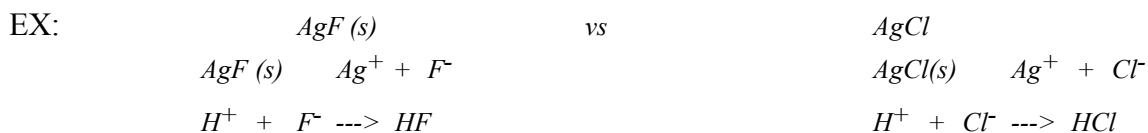
step 1: MOLE TABLE. Assume Double Replacement reaction goes to completion. Determine L.R. and what's left over.



EX: Adding NaCl to a saturated solution of AgCl would shift Eq to the LEFT. Reduce solubility!

b. Low pH (acidic conditions).

- Low pH INCREASES solubility for salts that contain conjugate bases of WEAK ACIDS!!!



c. Complex Ions: INCREASE solubility!!

- Late transition metals - Ag^+ , Cu^{2+} , Cd^{2+} , Hg^{2+} , Co^{3+} , Zn^{2+}
- CN^- , NH_3 , I^- , Cl^- , Br^- , OH^- ...
- # of molecules/atoms coordinated is 2 times charge....

EX: Show how sol of $\text{Co}(\text{OH})_3$ increases with addition of CN^- ions.

