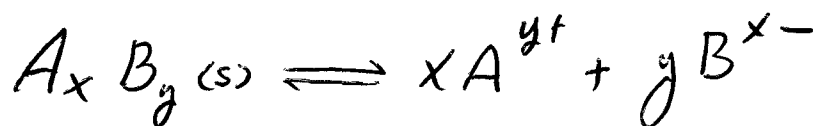


Chapter 19 ReviewSolubility

1. For a chemical reaction involving slightly soluble salts: such as



2. The solubility product constant is given as:

$$K_{sp} = [A^{y+}]^x [B^{x-}]^y$$

3. The solubility can be obtained as follows:

Let $s = \text{solubility in } \frac{\text{moles}}{L} = A^{y+} = B^{x-}$

$$\text{So } s = xS = yS$$

Then: $K_{sp} = (xS)^x (yS)^y$ ← To calculate K_{sp} given ' s '

$$K_{sp} = x^x y^y s^{x+y}$$

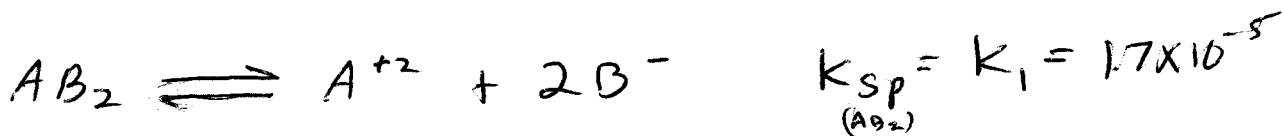
$$s = \sqrt[x+y]{\frac{K_{sp}}{x^x y^y}}$$

← To calculate ' s ' given ' K_{sp} '

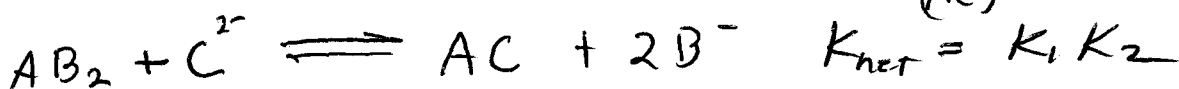
Example: the solubility of $Pb_3(AsO_4)_2$ is
 $s = 3.3 \times 10^{-8}$ Moles/L

Ch 19 CONT.

4. Simultaneous equilibria

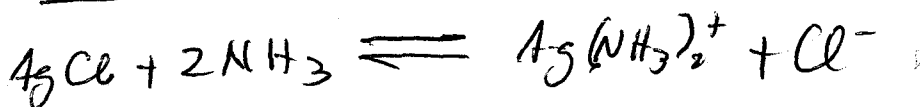
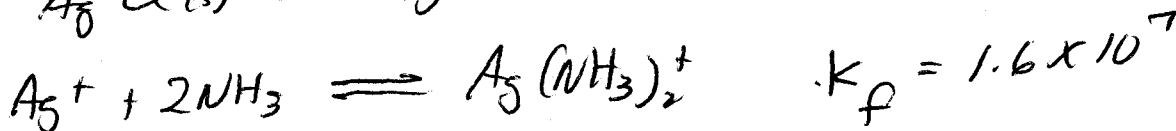
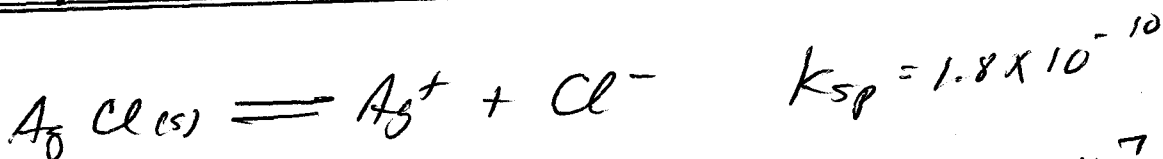


$$K_2 = \frac{1}{K_{sp}(AC)} = \frac{1}{1.8 \times 10^{-14}}$$



$$K_{net} = \frac{1.7 \times 10^{-5}}{1.8 \times 10^{-14}} = 9.4 \times 10^{-9}$$

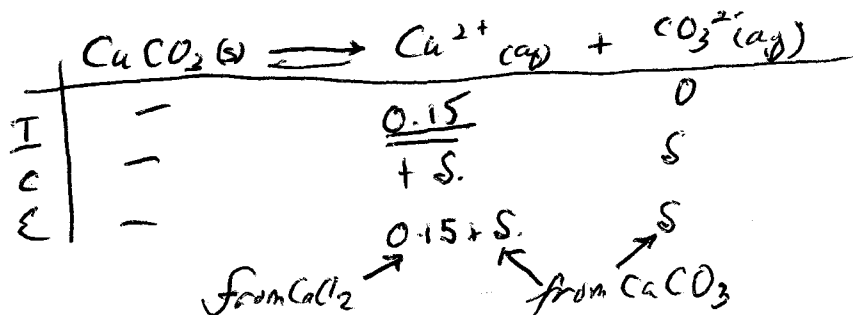
5. Complex Ions and solubility



$$K_{net} = K_{sp} K_f$$

6. Common Ion problems

egs. what is the solubility of $CaCO_3$ in $0.15M CaCl_2$



$$K_{sp} = [Ca^{2+}][CO_3^{2-}] = (0.15+s)(s)$$

0.15M Ca^{2+}
from $CaCl_2$
is common
ion.

EXAM III Review

Chapter 20 "Entropy & Free Energy"

- Define the second law of thermodynamics
- " Entropy.
- Calculate entropy change

$$\Delta S_{\text{universe}} = \Delta S_{\text{system}} + \Delta S_{\text{surroundings}}$$

$$\Delta S_{\text{system}} = \sum S^{\circ}_{\text{prod}} - \sum S^{\circ}_{\text{reactants}}$$

$$\Delta S_{\text{surroundings}} = -\frac{\Delta H_{\text{system}}}{T} \quad @ \text{CONST } P \text{ \& } T$$

- Know what the significance of the sign of ΔS (+ or -) for each case.
- Given the signs of ΔH° and ΔS° , know what is product favored.

Understand also when $\Delta H^{\circ}(-)$ and $\Delta S^{\circ}(-)$
 $\Delta H^{\circ}(+)$ and $\Delta S^{\circ}(+)$

Depends on magnitudes of ΔH° and ΔS° and on T .

