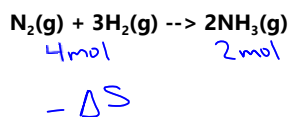## Daily Question 4/18

What does ΔS represent?

$\text{entropy - measures disorder}$

What is the sign for ΔS for the reaction below?

$$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$$
$$4 \text{ mol} \qquad 2 \text{ mol}$$

$$- \Delta S$$

Mar 10-10:33 AM

Wednesday, April 18th

Objective: **Students will review for their equilibrium quiz.**

1. Daily Question
2. Quiz: Keq and Le Chatelier's Principle
3. Ksp Notes

DUE: none

HW: none

Extra Credit Poem Due Now!

Materials: paper, writing utensil, calculator

Mar 10-10:30 AM

Ksp:

- Fancy name for Keq for the dissolving of slightly soluble salts.
  > General Equation: $aA(s) \longleftrightarrow bB^+(aq) + cC^-(aq)$

- Since the reaction is ALWAYS a solid,
  $Ksp = [B^+]^b[C^-]^c$; $Ksp = [\text{cation}]^b[\text{anion}]^c$
  > b and c are the coefficients on the ions

- The smaller Ksp is, the **_less_** soluble the salt

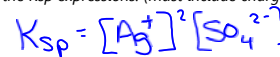- Ksp can be used to calculate the solubility of salts.

Mar 23-8:36 AM

Ksp:

1. **Write the Ksp expression for the solvation of Ag$_2$SO$_4$.** *First determine the ions that will be formed.*

$$Ag_2SO_{4(s)} \rightleftharpoons 2Ag^+ + SO_4^{2-}$$
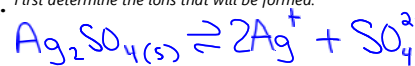
Put the ions in the Ksp expressions. (must include charges!)

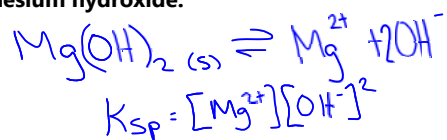$$Ksp = [Ag^+]^2[SO_4^{2-}]$$

Use the coefficients to determine how many moles of each ion will be formed. Put those numbers in for b and c (as exponents)

If the exponent is 1, it is not used in the expression!
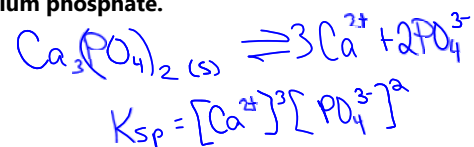
Mar 23-8:36 AM

1

Ksp:

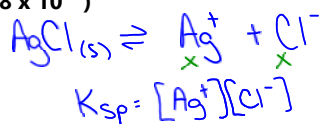1. Write the Ksp expression for the solvation of magnesium hydroxide.

$$Mg(OH)_2 {}_{(s)} \rightleftharpoons Mg^{2+} + 2OH^-$$

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

Mar 23-8:36 AM

Ksp:

1. Write the Ksp expression for the solvation of calcium phosphate.

$$Ca_3(PO_4)_2 {}_{(s)} \rightleftharpoons 3Ca^{2+} + 2PO_4^{3-}$$

$$K_{sp} = [Ca^{2+}]^3[PO_4^{3-}]^2$$

Mar 23-8:36 AM

Calculating Ksp:

1. Calculate the solubility for AgCl at 298K. ($Ksp=1.8 \times 10^{-10}$)

$$AgCl_{(s)} \rightleftharpoons Ag^+ + Cl^-$$
$$\phantom{AgCl_{(s)} \rightleftharpoons} x \quad\quad x$$

$$K_{sp} = [Ag^+][Cl^-]$$

$$1.8 \times 10^{-10} = X \cdot X$$
$$1.8 \times 10^{-10} = X^2$$
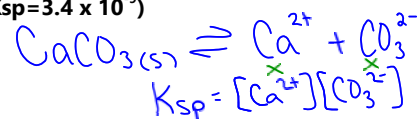
$$\sqrt{1.8 \times 10^{-10}} = X$$

$$1.34 \times 10^{-5} M = X$$

Mar 23-8:36 AM

Calculating Ksp:

1. Calculate the solubility for CaCO₃ at 298K. ($Ksp=3.4 \times 10^{-9}$)

$$CaCO_3 {}_{(s)} \rightleftharpoons Ca^{2+} + CO_3^{2-}$$
$$\phantom{CaCO_3 {}_{(s)} \rightleftharpoons} x \quad\quad x$$

$$K_{sp} = [Ca^{2+}][CO_3^{2-}]$$

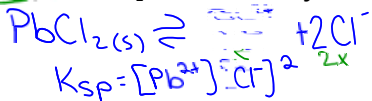$$3.4 \times 10^{-9} = X \cdot X$$
$$3.4 \times 10^{-9} = X^2$$

$$\sqrt{3.4 \times 10^{-9}} = X$$

$$5.83 \times 10^{-5} M = X$$

Mar 23-8:36 AM

Calculating Ksp:

1. Calculate the Ksp for $PbCl_2$ with a solubility of 5.0 x 10^{-3} mol/L.

$$PbCl_{2\,(s)} \rightleftharpoons Pb^{2+} + 2Cl^-$$
$$K_{SP} = [Pb^{2+}][Cl^-]^2$$
$$K_{SP} = x \cdot (2x)^2$$
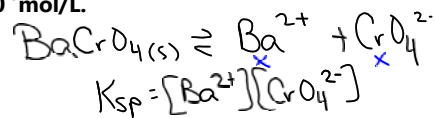$$K_{SP} = 4x^3$$
$$K_{SP} = 4(5\times10^{-3})^3$$
$$\boxed{K_{SP} = 5\times10^{-7}}$$

Mar 23-8:36 AM

Calculating Ksp:

1. Calculate the Ksp for $BaCrO_4$ with a solubility of 1.5 x 10^{-5} mol/L.

$$BaCrO_{4\,(s)} \rightleftharpoons Ba^{2+} + CrO_4^{2-}$$
$$K_{SP} = [Ba^{2+}][CrO_4^{2-}]$$
$$K_{SP} = x^2$$
$$K_{SP} = (1.5\times10^{-5})^2$$
$$\boxed{K_{SP} = 2.25\times10^{-10}}$$

Mar 23-8:36 AM