Science Notebook

40S
Chemistry
Solutions and Solubility Equilibrium

Chemistry 40S

Solutions
KSP Assignment 1

Answer the following questions in the spaces provided.

1. Write the equation for the dissolving of calcium sulfate, $CaSO_4$. Write the solubility product expression. $K_{sp} = 2.4 \times 10^{-5}$.
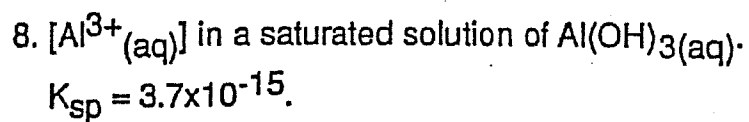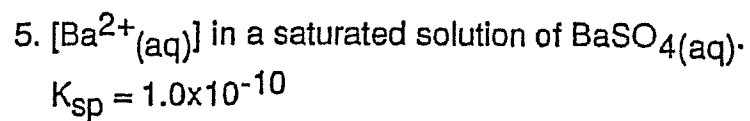
2. Write the equation for the dissociation of silver chromate, Ag_2CrO_4. Write the solubility product expression. Silver chromate dissolves to give Ag^+ and CrO_4^{2-} ions.

3. Compare the K_{sp} values for AgCl ($K_{sp} = 1.7 \times 10^{-10}$), AgBr ($K_{sp} = 5.0 \times 10^{-13}$), and AgI ($K_{sp} = 8.5 \times 10^{-17}$). Which of these compounds is most soluble in water? Which are least soluble?

4. The solubility product constant of silver iodide, AgI is 8.5×10^{-17}. What is the $[Ag^+]$ in a solution at equilibrium?

Calculate the concentration of the ion indicated in a saturated solution of each of the following salts. **Show all work.**

5. $[Ba^{2+}_{(aq)}]$ in a saturated solution of $BaSO_{4(aq)}$.

$K_{sp} = 1.0 \times 10^{-10}$

6. $[Cl^-_{(aq)}]$ in a saturated solution of $AgCl_{(aq)}$. $K_{sp} = 1.7 \times 10^{-10}$.

7. $[I^-_{(aq)}]$ in a saturated solution of $PbI_2(aq)$. $K_{sp} = 8.7 \times 10^{-9}$.

8. $[Al^{3+}_{(aq)}]$ in a saturated solution of $Al(OH)_{3(aq)}$.

$K_{sp} = 3.7 \times 10^{-15}$.

40S
Chemistry

Solutions
KSP Assignment 2

Answer the following questions in the spaces provided. **Show all necessary work.**

1. If $[D^+]$ is 2.00×10^{-5} mol/L at equilibrium, what is the K_{sp} for D_2A?

2. What is the concentration of Be^{2+} in a saturated solution of $Be(OH)_2$? $K_{sp} = 1.60 \times 10^{-22}$.

3. A saturated solution of PbI_2 has a lead ion concentration of 1.21×10^{-3}. What is K_{sp} for PbI_2?

4. The solubility product of MnS is 1.40×10^{-15}. What concentration of sulfide ion is needed in a 0.100 mol/L solution of $Mn(NO_3)_2$ to just precipitate MnS?

40S
Chemistry

Solutions
KSP Assignment 3

For each of the following Ksp questions, find:
   a) The dissociation equation.
   b) The Ksp expression.
   c) The molar solubility of the substance.
   d) The concentration of each ion in the solution.

1. $AgCl$ $Ksp = 1.77 \times 10^{-10}$

2. $AlPO_4$ $Ksp = 9.83 \times 10^{-21}$

3. $BaSO_4$ $Ksp = 1.07 \times 10^{-10}$

4. $Sn(OH)_2$ $Ksp = 5.45 \times 10^{-27}$

5. Ag_2CrO_4 $Ksp = 1.12 \times 10^{-12}$

6. $Fe(OH)_3$ $Ksp = 2.64 \times 10^{-39}$

7. Ag_3PO_4 $Ksp = 8.88 \times 10^{-17}$

8. $Al(OH)_3$ $Ksp = 3.50 \times 10^{-24}$

9. Bi_2S_3 $Ksp = 1.82 \times 10^{-15}$

10. $Cu_3(PO_4)_2$ $Ksp = 1.93 \times 10^{-37}$

40S

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Solutions
KSP Assignment 4

Answer the following questions in you Chemistry notebook. Show all of you work when answering problems.

1. Silver iodide, AgI, has a solubility product of 8.5×10^{-17}. What is the solubility, in moles per Litre, of AgI in

   a) pure water

   b) b) 0.010 mol/L HI

   c) 0.010 mol/L MgI_2

   d) d) 0.010 mol/L $AgNO_3$

2. Magnesium fluoride, MgF_2, has a solubility product of 8.0×10^{-8}. Calculate the solubility, in mol/L, of magnesium fluoride in

   a) pure water

   b) b) 0.50 mol/L NaF

   c) 0.50 mol/L $MgCl_2$

3. Gold (III) chloride, $AuCl_3$, has a Ksp of 3.2×10^{-25}. Calculate its solubility, in mol/L, in

   a) pure water

   b) b) 0.20 mol/L HCl

   c) 0.20 mol/L $MgCl_2$

   d) d) 0.20 mol/L $Au(NO_3)_3$

40S
Chemistry

Solutions
KSP Assignment 5

Answer the following questions in you Chemistry notebook. Show all of you work when answering problems.

1. Write the dissociation equation and the solubility product expression for each of the following:

   a) $PbSO_4$

   b) $Al_2(SO_3)_3$

   c) $Fe_2(SO_4)_3$

2. Given the compounds' K_{sp}, calculate their solubilities in mol/L and g/L.

   a) CuS $Ksp = 6.31 \times 10^{-33}$

   b) PbI_2 $Ksp = 1.39 \times 10^{-8}$

3. From the following solubilities, calculate the K_{sp}:

   a) CaF_2 $1.70 \times 10\text{-}5$ g/mL

   b) $BaCO_3$ 0.0138 g/L

4. If 6.7×10^{-5} g of AgBr is all that can be dissolved at 25°C in 500.0 mL, calculate the solubility product of AgBr.

5. At 25°C, a saturated solution of iron (III) hydroxide has an iron concentration of 1.3×10^{-13} mol/L. Calculate the K_{sp} of iron (III) hydroxide.