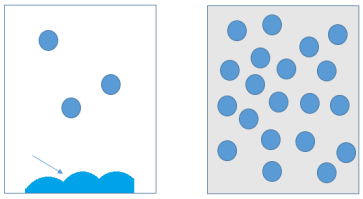
AP Chemistry Daily Videos

7.11 Introduction to Solubility Equilibria

Video #1

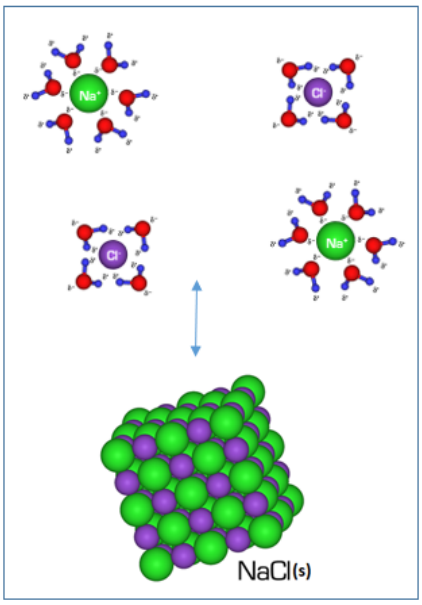
1. Label each diagram as highly soluble or slightly soluble. Also,identify the term for solid particles that form at the bottom of an aqueous solution.



2. If you have an unsaturated solution, that means more solute can still be dissolved. If you continue to add solute, you will start to see solid collecting at the bottom. This change indicates the solution is now a _____ solution.

3. Explain how to write a Ksp equation and what it means. Go back to #1 and identify which diagram has a high Ksp value.

4. Ksp describes an equilibrium between what? Use the picture and equation below to help you.



$$NaCl_{(s)} \leftrightarrow Na^{+}_{(aq)} + Cl^{-}_{(aq)}$$

5. Is it technically accurate to say a substance is insoluble? Why or why not? Provide an example of the Ksp value for a substance that is essentially insoluble.

II 5:15

6. What is a common error the instructor warns you about?

7. Evaluate how well you did on this problem and identify any errors you may have made.

The solubility constant of PbI_2 is 7.10×10^{-9} .
(a) Calculate the molar solubility.
(b) Calculate the solubility in g/L.

R	$PbI_2(s) \rightleftharpoons$	$Pb^{2+}(aq) +$	$2I^-(aq)$
I	Some solid is evidence the solution is saturated		
C			
E			

8. Write down the 4 main points at the end of the video.
   1.
   2.
   3.
   4.

[Video #2]

II 3:00

1. What is comparing Ksp values by themselves not a good idea?

II 4:24

2. Complete the table:

Qsp<Ksp	Qsp>Ksp
There are _____ ions.	There are _____ ions.
Solution is _____	Solution is _____
A precipitate _____	A precipitate _____

3. **Take notes on the sample problem the instructor completed. What did you learn?**

Video #3

1. **Take notes on the steps your instructor takes to solve the following problems.**
    1. A saturated solution of tin(II) hydroxide has a hydroxide ion concentration of 2.2×10^{-9} *M*. Calculate the K_{SP} for $Sn(OH)_2$

    2. Would a saturated solution of $Cr(OH)_3$ have a higher or lower concentration of hydroxide ion than the saturated $Sn(OH)_2$ solution? Justify your answer.

    3. Solutions of $Cr(NO_3)_3$ and KOH are mixed. The final molarity of $Cr(NO_3)_3$ is 1.1×10^{-8} *M* and the final molarity of KOH is 9.5×10^{-9} *M*. Will a precipitate form? Justify your answer.

***Note, nitrates and most Group 1 elements are highly soluble, meaning they ionize completely. Notice there's no equilibrium sign here, only a forward yield sign. $Cr(NO_3)_{3(s)} \rightarrow Cr^{3+}_{(aq)} + 3NO_3^-{}_{(aq)}$, the mole ratio is 1:1:3. All of the $Cr(NO_3)_3$ becomes products, so Cr^{3+} is the same concentration as $Cr(NO_3)_3$, 1.1×10^{-8}M. $KOH_{(s)} \rightarrow K^+_{(aq)} + OH^-_{(aq)}$, 1:1:1, so OH^- equals 9.5×10^{-9}M. In short, by telling you the concentrations of the reactants of highly soluble substances, they are giving you enough information to find the concentrations of the ions.**

2. How did you do?

A saturated solution of $Cd_3(PO_4)_2$ can be represented by the chemical equation shown. Which expression relates the solubility, *S*, to the K_{sp}?

$$Cd_3(PO_4)_2(s) \rightleftharpoons 3Mg^{2+}(aq) + 2PO_4^{3-}(aq)$$

a) $S = \sqrt[6]{\frac{K_{sp}}{108}}$

b) $S = 108 \times \sqrt[5]{K_{sp}}$

c) $S = \sqrt[5]{K_{sp}}$

d) $S = \sqrt[5]{\frac{K_{sp}}{108}}$