CONCEPT: SOLUBILITY PRODUCT CONSTANT: Ksp

- **Solubility Product Constant (Ksp)** measures _____ of solid ionic compounds in a solvent at equilibrium.
  - □ *Solubility* is the maximum amount of solid _____ in a solvent, usually represented as M (molar solubility).
- Magnitude of **Ksp** value determines _____ of solubility
  - □ ___ Ksp: _____ soluble the solid; ___ Ksp: _____ soluble the solid
    - This comparison can only be used between compounds that break up into the _____ number of ions.

EXAMPLE: Given the following ionic compounds, which will have the highest $[OH^-]$ concentration? Hint: which is most soluble in water?

a) $Fe(OH)_2$ Ksp = 4.87×10^{-17} b) $Pb(OH)_2$ Ksp = 1.43×10^{-20}

c) $Mg(OH)_2$ Ksp = 2.06×10^{-13} d) $Sn(OH)_2$ Ksp = 5.45×10^{-27}

Ksp Calculations

- Solubility is an _____ process; hence calculations will require an ICE chart.

Ksp Formula

$aA\,(s) \rightleftharpoons bB\,(aq) + cC\,(aq)$

□ a, b, c, = coefficients

Ksp = products = $[B]^b\,[C]^c$

EXAMPLE: PbF_2 is a white solid and has diverse applications in pharmaceuticals, metallurgy, and technology. If the concentration of lead (II) fluoride is 4.2 M with a Ksp = 3.6×10^{-8}, calculate the molar solubility of this solid at 25ºC.

ICE Chart (Ksp)

	$PbF_2\,(s)$	$\rightleftharpoons$	$Pb^{+2}\,(aq)$	+	$2\,F^-\,(aq)$
I					
C					
E					

STEP 1: Set up an ICE Chart with solid as the only reactant; cross out the _____ side.

STEP 2: Using **INITIAL ROW**, set products equal to zero.

STEP 3: We lose reactants to make products.

- □ Using the **CHANGE ROW**, place a _____ for the products

STEP 4: Using the **EQUILIBRIUM ROW**, set up the equilibrium constant expression with _____ and solve for ____.

- □ variable ____ in the ICE chart represents molar _____ of a solid

CONCEPT: SOLUBILITY PRODUCT CONSTANT: Ksp

PRACTICE: Solubility of $Sn(OH)_2$ was found to be 1.11×10^{-9} M; calculate Ksp of this compound.

PRACTICE: If a saturated solution of Ag_2CO_3 contains 2.56×10^{-4} M of Ag^+ ions, determine its solubility product constant.

PRACTICE: What is the solubility of CN- ions in a solution of 5.5 M $Hg_2(CN)_2$, with a Ksp of 5.0×10^{-40}?