CONCEPT: Ksp: COMMON ION EFFECT
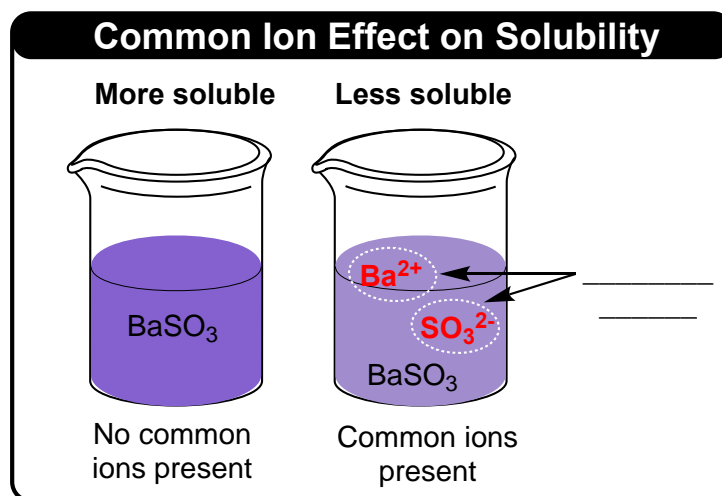
● Common ion effect _____ the solubility of a solid in a solution

    □ Occurs when an ionic solid dissolves in a solution containing ion(s) _____ to it.

    □ Decrease in solubility is due to *Le Chatelier's principle*.

Common Ion Effect on Solubility

More soluble   Less soluble

$BaSO_3$ Ba^{2+} SO_3^{2-} $BaSO_3$

No common ions present   Common ions present

EXAMPLE: Determine molar solubility of $CuCO_3$ (Ksp = 2.4 x 10^{-10}) in 0.15 M $MgCO_3$ solution.

ICE Chart (Common Ion)

$$CuCO_3 \ (s) \ \rightleftharpoons \ Cu^{+2} \ (aq) \ + \ CO_3^{2-}(aq)$$

I _____

C _____

E _____

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

STEP 2: Using **INITIAL ROW**, place the amount given for the _____ ion(s).

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 x and its number can be _____ if it follows a real number

STEP 5: Convert found value of x into appropriate units if necessary.

CONCEPT: Ksp: COMMON ION EFFECT

Common Ion Effect: Acids & Bases

● A *common ion effect* can also occur with _____ and _____.

　□ Solubility of base _____ if solution contains [OH^-]; solubility of acid _____ if solution contains [H^+]

EXAMPLE: Find solubility (g/mL) of $Cr(OH)_3$ ($Ksp = 6.7 \times 10^{-31}$) if the solution is buffered at pH of 8.4 at 25ºC.

ICE Chart (Common Ion)

$$Cr(OH)_3 \text{ (s)} \rightleftharpoons Cr^{+3} \text{ (aq)} + 3\ OH^- \text{ (aq)}$$

I_____

C_____

E_____

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

STEP 2: Using **INITIAL ROW**, place the amount given for the _____ ion(s).

　□ Calculate [OH^-] or [H^+] from given pH or pOH.

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 x and its number can be _____ if it follows a real number

STEP 5: Convert found value of x into appropriate units if necessary.

<u>**CONCEPT:**</u> Ksp: COMMON ION EFFECT

PRACTICE: Which of the following compounds will become more soluble in basic solution?

a) PbF_2 (s)

b) $ZnCl_2$ (s)

c) $Al(OH)_3$ (s)

d) $MgCO_3$ (s)

PRACTICE: A solution of $Ba(OH)_2$ has a Ksp of 5.0×10^{-3}.

i) Determine the pH of this solution.

ii) Determine the pH if $Ba(OH)_2$ was added to a solution containing 3.2 M of BaF_2 and 0.94 M of $Al(OH)_3$.