

## Solubility & Ksp

& Nuclear

## Ksp

- Ksp - the study of the solubility of insoluble ionic compounds ???
- Ksp - solubility product constant

## Writing Ksp Expressions

- $\text{CaF}_2(s) \leftrightarrow \text{Ca}^{+2} + 2\text{F}^-$
- $\text{Mg}_3(\text{PO}_4)_2(s) \leftrightarrow 3\text{Mg}^{+2} + 2\text{PO}_4^{-3}$
- $\text{BaSO}_4(s) \leftrightarrow \text{Ba}^{+2} + \text{SO}_4^{-2}$

## Example

- The solubility of CuBr is  $2.0 \times 10^{-4}$  M. What is the value of Ksp?

### Example 2

- What is the molar solubility of  $\text{Ag}_2\text{S}$  if the  $K_{\text{sp}}$  is  $1.6 \times 10^{-49}$ ?

### Example 3

- What is the molar solubility of bismuth (III) sulfide if the  $K_{\text{sp}}$  is  $1.1 \times 10^{-73}$ ?

### Example 4

- The pH of a solution of  $\text{Fe}(\text{OH})_3$  is 2. What is the molar solubility?  
 $K_{\text{sp}} = 4 \times 10^{-38}$ .

### Will a solid form???

- Compare  $K_{\text{sp}}$  to  $Q_{\text{sp}}$
- $Q > K$  = yes ppt will form
- $Q < K$  = no ppt
- $Q$  is reaction quotient...just like  $K$  but not at equilibrium

### Example

- Will a ppt form? 50.0 ml of a 0.00025 M  $\text{Na}_3\text{PO}_4$  solution is mixed with 50.0 ml of 0.0025 M  $\text{BaCl}_2$ .  $K_{sp}$  of  $\text{Ba}_3(\text{PO}_4)_2$  is  $6 \times 10^{-39}$ .

### Competing ppt

- $\text{NaCl}$  is added to a 50 ml beaker that contains a mixture of 0.00015 M  $\text{Pb}(\text{NO}_3)_2$  and 0.00035 M  $\text{AgNO}_3$ . What ppt will form 1st? Show your work.