

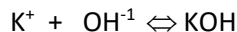


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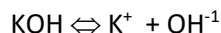
### Modeling and determining equilibrium of solubility

A salt KOH is dissolved by the following reaction.

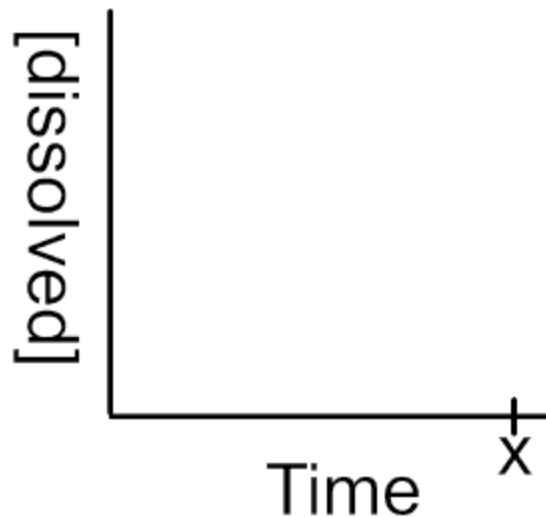


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- What happens to the value of K if this substance is really soluble?

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*To allow K to correspond with solubility, industrial scientist who created this method chose to always write the dissolving reaction with the solid on the left as see below.*

*$KOH(s) \rightleftharpoons K^+(aq) + OH^{-1}$  To distinguish this method they gave it a special name "solubility product"*

$$K_{sp} = [K^+][OH^{-1}]$$

You take a sample of salt (table) and you start to dissolve it in water. You continue to add and stir the solution. After a period of time it appears solid is forming on the bottom.

- Write the (Ksp) solubility equation.
- This chemical reaction goes to (completion/equilibrium).
- To the right draw a picture of table salt dissolving. The reaction gets saturated at time X.
- A student hypothesizes that stirring increases solubility. Confirm or counter this statement.
- How might you increase the solubility of table salt in water.
- Draw the picture of table salt in the beaker to the right at time X.



A student dissolved  $\text{Ag}_2\text{SO}_4$  in 100mL of water. The student added 5g of silver sulfate to the solution and measured the concentration of  $\text{SO}_4^{2-}$  to be 0.0135M and solid is on the bottom. Answer the following questions.

- Draw the beaker.
- Based on your picture, if the  $\text{SO}_4^{2-} = 0.0135$ , what is the  $[\text{Ag}^+]$  ?
- How might these concentrations change if 5 more grams of solid is added?
- Create an ISE reaction table, Fill it out and determine the K value.



Two salts are dissolving,  $\text{AgBr}$  ( $K_{sp} = 5\text{E-}13$ ) and  $\text{AgCl}$  ( $K_{sp} = 1.6\text{E-}10$ ), Answer the following questions.

- Write out the dissolving equation for each.
- Write out the solubility expression.
- A large K value means what relative to solubility?
- Which of the two salts is more soluble?
- Draw a saturated solution of the more soluble salt.



A student comes across a solution that is saturated solution of lead(II) chloride. The lead ion has a concentration of  $1.5\text{E-}5\text{M}$ . Answer the following questions.

- Write out the solubility reaction.
- Write out the solubility equilibrium expression.
- Draw a picture of this reaction mixture.
- What is the concentration of the Chloride ion?
- What is the equilibrium constant for this reaction?

